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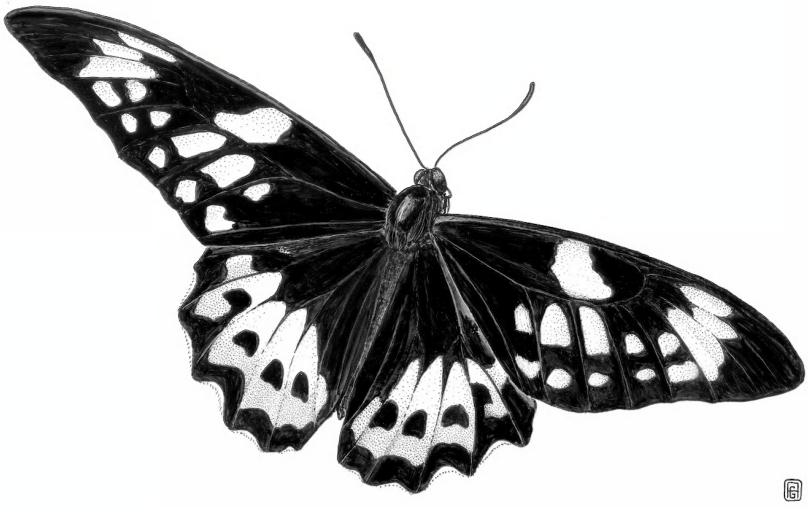

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NOTES ON THE ENDEMIC FIJIAN GENUS *PTOCHOSIPHLA* MEYRICK (LEPIDOPTERA: EREBIDAE: HYPENINAE), WITH THE DESCRIPTION OF A NEW SPECIES

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Abstract

The currently monotypic endemic Fijian genus *Ptochosiphla* Meyrick is reviewed and the new species *P. purpurescens* **sp. n.** is described. Meyrick's generic description is slightly modified to accommodate the new species. The adults and genitalia of both species are illustrated where available.

Introduction

As in the tropics generally, Fiji has a diverse fauna of erebid moths, with 132 species currently recorded. In the Herminiinae, the genus *Lophocoleus* Butler shows considerable radiation, with five of the six Fijian species endemic based on current knowledge. Three related genera, *Tholocoleus* Robinson, *Palaeocoleus* Robinson and *Archaeocoleus* Clayton, are also known only from Fiji (Robinson 1975, Clayton 2015). In the Boletobiinae, the genus *Hypenagonia* Hampson also shows radiation, with the five Fijian species all endemic (Robinson 1975). Twelve species of Hypeninae have previously been recorded, belonging to two genera: *Hypena* Schrank and *Ptochosiphla* Meyrick. Eight of these species are currently known only from Fiji.

Meyrick (1933) described the genus *Ptochosiphla* and its sole member *P. oedipus* from a single male from Vunindawa, Naitasiri Province on Viti Levu, from the collection of H. Phillips [now in the Natural History Museum, London]. The present study found 13 males that could be assigned to *P. oedipus* (Fig. 1). Seven females had similar wing patterns and coloration and were associated with the males, based on their appearance and co-occurrence on the same dates and at the same locations (Fig. 2). Three additional males show much in common with *P. oedipus* and agree with Meyrick's generic description in detail for most of his characteristics. However, these three males show distinct differences from *P. oedipus*, especially in the genitalia but also in the detail of the fasciae and the form of the wings. They are here described as *P. purpurescens* **sp. n**. and illustrated (Fig. 3). The genitalia for both species are also illustrated (Figs 4-8). In order to accommodate this new species, Meyrick's generic description is slightly broadened.

In the present study all the recorded examples of *P. oedipus* were taken in primary forest locations at varying altitudes up to 200 m. The three examples of *P. purpurescens* were all taken at one of these locations in Tailevu Province. There were no significant differences between the habitat at this and other lowland forest locations where *P. oedipus* was collected. No life history details are available for either of these species.

Materials and methods

A regular programme of light trapping was carried out from 1991-1998 at various lowland forest locations in the Eastern Viti Levu provinces of Serua [18°09′S, 178°01′E], Namosi [18°06′S, 178°10′E], Tailevu [17°55′S, 178°30′E], Savura [18°04′S, 178°26′E] and in the Suva area [18°09′S, 178°26′E]. A small number of visits were also made to Cakaudrove Province in Vanua Levu [16°25′S, 179°54′E]. These locations ranged in altitude from sea level to 200 m. Recording also took place in montane forest in Naitasiri Province in Viti Levu [17°43′S, 178°01′E] at an altitude of 900 m. A battery-powered trap was employed, using a 6W actinic tube as a light source. This allowed easier access to more remote locations. A small number of further visits were made up to 2013. The use of molecular data for this genus is beyond the scope of this paper.

All types of *P. purpurescens* and typical examples of *P. oedipus*, together with genitalia slides, have been deposited in the National Museums of Scotland, Edinburgh.

Systematics

The genus *Ptochosiphla* was established by Meyrick (1933), with *P. oedipus* as its sole member. He placed the genus in Pyralididae, now Pyralidae. Robinson and Shaffer (1980) transferred it to Noctuidae: Hypeninae. Poole (1989) confirmed this placement. Zahiri *et al* (2011) transferred the Hypeninae to the Erebidae.

Family Erebidae

Subfamily Hypeninae

Genus *Ptochosiphla* Meyrick, 1933

Type species *Ptochosiphla oedipus* Meyrick, 1933.

Meyrick (1933) gave a comprehensive generic description for *Ptochosiphla*, based on a single male of *P. oedipus*. He defined the genus based on characters of the male, including 'antennae serrate, biciliate with fascicles, scape moderate; labial palpi long, straight, porrect, expanded with dense rough scales dimishing to apex, terminal joint concealed; maxillary palpi absent; hind tibiae densely tufted with rough hairs.' He then described the forewing venation. For the hind wings he wrote 'much reduced, about half length of forewings, rounded with large glandular swelling occupying anterior half of costa and strong subdorsal fold and groove; neuration much contorted and not accurately determinable'.

In the description of *P. oedipus,* Meyrick gave the usual description of colour and markings and, for the forewings, 'an abrupt angular indentation above tornus.' For the hind wings, he repeated the generic description that they are half the length of the forewings and rather more than half the width. He also noted that there is a 'large whitish-ochreous hair pencil in the subdorsal fold.'

In this situation with a new monotypic genus, Meyrick divided characters between the generic and specific descriptions based on his experience. With the discovery of a second congener and its description here, it is necessary to slightly modify Meyrick's generic description. While the new species is placed in *Ptochosiphla,* it lacks a glandular swelling on the anterior half of the costa and the generally distorted venation in the hind wing, one of the features of his description. These issues are fully dealt with in the description of *P. purpurescens*.

Robinson (1975) discussed the Macrolepidoptera of Fiji but did not deal with *Ptochosiphla* as, at that time, it was placed in the Pyralidae. So far as is known, the genus is endemic to Fiji and it appears that it has received no further attention. Meyrick (1933) noted that 'This genus of undoubted South American affinity is of much interest' but a discussion of this affinity is outside the scope of the present paper.

Ptochosiphla oedipus **Meyrick, 1933**

(Figs 1-2, 4-5, 8)

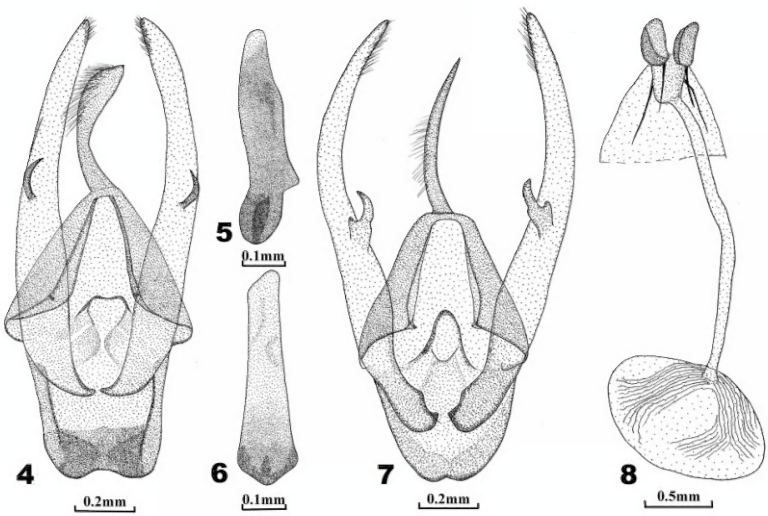
Material examined. 20 specimens: 3 ♂♂, 2 ♀♀, Savura (2.xii.91, 13.xii.91, 5.vi.92, 30.vi.92); 6 ♂♂, 4 ♀♀, Namosi (1.iv.93, 11.xi.93, 4.i.94, 27.v.95, 10.xii.95, 12.xi.96, 29.iii.97, 30.ii.06); 3 ♂♂, 1 ♀, Tailevu (28.iv.93, 4.ii.94, 7.vi.94); 1 ♂, Serua (12.iv.97).

Notes. The females were associated with this species on the following basis: the same general coloration and appearance; the positions on the forewing and detailed form of the antemedian and postmedian fasciae; their co-occurrence on the same dates and at the same locations as males. Mayrick's male type is located in the Natural History Museum, London but typical examples of the newly described female have been deposited in the National Museums of Scotland, Edinburgh, as have the male and female genitalia slides for completeness.

Description. Male (Fig. 1). Described by Meyrick (1933), whose description is augmented as follows: Genitalia (Fig. 4): valves simple, narrow, length about ten times width; narrow, curved, pointed sclerotised process at just beyond one-half; base of valves tapering to a curved point; base of vinculum broadened with two shallow lobes; uncus broadened in terminal half; aedeagus (Fig. 5) without cornuti; base rounded below a lateral projection.

Female (Fig. 2). Head: vertex and labial palpi pale brown; maxilliary palpi absent. Thorax: dorsum pale brown. Wingspan 13-14 mm. Forewings: subtriangular but narrower than in male and with no indentation above tornus; costa bowed in basal fifth and only slightly so in remainder; apex acute, somewhat rounded; termen inclined inwards and slightly convex; ground colour dull reddish brown; antemedian fascia in the form of a pale yellowish buff line, outlined on either side with dark reddish brown; largely straight from costa at one-quarter to dorsum at two-fifths; postmedian fascia

Figs 1-3. *Ptochosiphla* spp: (1-2) *P. oedipus* Meyrick: (1) male; (2) female. (3) *P. purpurescens* **sp. n.** holotype male.



Figs 4-8. Genitalia of *Ptochosiphla* spp: (4-7) male genitalia and aedeagus: (4-5) *P. oedipus* Meyrick; (6-7) *P. purpurescens* **sp. n.** (8) female genitalia of *P. oedipus*.

of similar form, from costa at one-half to dorsum at two-thirds, indented basally at one-third and less so at two-thirds; subterminal fascia from costa before apex to tornus, consisting of a row of faint buff markings; terminal fascia of similar form, followed by a series of small, faint, dark dots; cilia similar colour to wings, but less reddish; four pale buff dots on costa in a sequence from two-thirds to apex. Hind wings: uniform pale buff, with darker terminal line; cilia pale buff. Abdomen: uniform pale buff. Genitalia (Fig. 8): lacking in specific features, especially in the region of the sterigma and ostium; ductus bursae long and narrow; bursa copulatrix ovoid, lacking signa.

Comments. In the male, the forewing indentation above the tornus clearly separates *P. oedipus* from *P. purpurescens*. The female of *P. purpurescens* is unknown. The species is discussed further under *P. purpurescens*.

***Ptochosiphla purpurescens* sp. n.**

(Figs 3, 6-7)

Types. Holotype ♂, FIJI, Viti Levu, Nukurua, Tailevu province [-17°55'50" 178°29'44"], 12.ii.93, at light, J.A. Clayton. *Paratypes*: 1 ♂ same data as holotype; 1 ♂ same data as holotype except 7.vi.94. All deposited in the National Museums of Scotland, Edinburgh.

Description. Male (Fig. 3). Head: vertex purplish buff; labial palpi porrect, buff with some brown scales; second segment approximately three times the length of terminal segment and clothed in long hair-scales that largely conceal terminal segment; maxilliary palpi absent; antennae buff, approximately two-thirds length of forewing; biciliate and fasciculate and with moderate scape clothed in hair scales. Thorax: pale buff, with purplish shading anteriorly and posteriorly. Wingspan 12-13 mm. Forewings: subtriangular; costa slightly bowed; apex rectangular; termen very slightly bowed; ground colour dull purplish buff; irregular, narrow pale buff shading along costa; antemedian fascia in the form of a straight but irregular orange-brown line from costa at one-quarter to dorsum at one-third; median fascia a straight, diffuse and somewhat irregular band of similar colour from costa at one-half to dorsum at two-thirds; these first two fasciae terminating on costa in a small blackish mark; antemedian fascia a line of similar colour, outlined faintly both basad and terminad with pale buff, from costa at one-half where it coalesces with the median facia, then bent terminad at one-fifth, then again basad at one-half to run to termen parallel with and only slightly separated from median fascia; subterminal fascia a diffuse and irregular pale brownish band from costa just before apex to dorsum just before tornus, outlined distad in pale buff; terminal fascia a series of brown dashes, outlined in pale buff; cilia darker basally, shading to pale buff. Hind wings: venation simple; uniform pale buff, with darker terminal line; cilia as in forewings; subdorsal fold containing large whitish-ochreous hair pencil. Hind tibia with large, dark scale tuft. Abdomen: uniform pale buff. Genitalia (Fig. 7): valves simple, narrow, length about twelve times width; broad curved, pointed, sclerotised

process with a distinct shoulder at just beyond one-half; base of valves broad, hardly tapering, with a small point directed inwards; base of vinculum rounded with shallow central indentation; uncus tapering throughout; aedeagus (Fig. 6) without cornuti; broadened smoothly towards somewhat angular base.

Female. Unknown.

Comments. Male *P. purpurescens* can be readily separated from *P. oedipus* by the absence of an angular indentation in the termen above the tornus in the forewing; in *P. purpurescens* the forewing median fascia is irregular but more or less straight, whereas in *P. oedipus* it is distinctly extended basad at one-third. In the male genitalia, the narrow tapering uncus is diagnostic compared with the distally swollen uncus in *P. oedipus*; the shape of the sclerotised processes on the valves is also diagnostic, as are the shape of the valve bases and the base of the tegumen. The aedeagus of *P. purpurescens* expands uniformly towards the base, which is angular; in *P. oedipus* the base is rounded below a lateral projection.

*Taxonomy.*The male *P. purpurescens* shows all the features in Meyrick's generic description except, in the hind wing, for the glandular swelling on the anterior half of the costa and the generally distorted venation. The general form of the forewing markings is similar to *P. oedipus* and the genitalia are extremely so. Based on all these characteristics, the species is placed in *Ptochosiphla.* A necessary consequential change is that the hind wing costal glandular swelling and distorted venation are removed as characteristics from the generic description and become a feature specific to *P. oedipus.* Both species show the subdorsal fold in the hind wing containing a large whitish-ochreous hair pencil. It is possible that this should be included in the generic description but this change is not proposed here based on two species and can wait until the addition of further species to *Ptochosiphla* and / or the moth fauna of Fuji is more rigorously documented.

Etymology. The name *purpurescens* (Latin adjective) refers to the general purplish colour of the forewings.

Acknowledgements

I am indebted Dr Keith Bland for many helpful discussions and advice and for arranging access to the entomological collections and other facilities at the National Museums of Scotland. I also thank the staff of the School of Science, Technology and Environment, the University of the South Pacific, Suva, Fiji, for providing access to resources and facilities at the University.

References

CLAYTON, J.A. 2015. The *Lophocoleus* group of genera (Lepidoptera: Erebidae: Herminiinae) in Fiji, with the description of a new genus and species. *Australian Entomologist* **42**(1): 1-12.

MEYRICK, E. 1933. *Exotic Microlepidoptera* – Vol 4. Privately published, London; 1-642.

POOLE, R.W. 1989. *Lepidopterorum Catalogus (new series)* **118**: 1-1314. E.J.Brill, Leiden.

ROBINSON, G.S. 1975. *The Macrolepidoptera of Fiji and Rotuma – a taxonomic and geographic study.* E.W.Classey Ltd, Faringdon, Oxon.

ROBINSON, G.S. and SHAFFER, M. 1980. Noctuidae: Hypeninae, in: WATSON, A., FLETCHER, D.S. and NYE, I.W.B., in: NYE, I.W.B. (ed.), *Generic names of moths of the World* **2**: 1-228**.** Trustees of the British Museum (Natural History), London.

ZAHIRI, R., KITCHING, I.J., LAFONTAINE, J.D., MUTANEN, M. KAILA, L., HOLLOWAY, J.D. and WAHLBERG, N. 2011. A new molecular phylogeny offers hope for a stable family-level classification of the Noctuoidea (Lepidoptera). *Zoologica Scripta* **40**: 158-173.

AN ADDITIONAL RECORD OF *ANTHENE SELTUTTUS* (RÖBER, 1886) (LEPIDOPTERA: LYCAENIDAE) FROM CENTRAL QUEENSLAND

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Abstract

Anthene seltuttus affinis (Waterhouse & R.E. Turner, 1905) is recorded from a second site in the Gladstone district, Queensland, based on a report from Tannum Sands on 19 January 2002. Its occurrence at two sites, approximately 18 km and 15 years apart, suggests that the butterfly is permanently established in the Gladstone district, which is the southern limit of the species.

Braby and Hsu (2019) recently recorded the lycaenid butterfly *Anthene seltuttus affinis* (Waterhouse & R.E. Turner, 1905) from Gladstone on the central Queensland coast. The record was considered noteworthy because it extended the known geographical range of the species by approximately 90 km SE of Rockhampton, its previous southern range limit (Braby 2000).

It has since come to our attention that the butterfly had previously been recorded from the Gladstone district 15 years earlier by Dunn (2008) who, in discussing the occurrence of *Anthene lycaenoides* (C. Felder, 1760) at Tannum Sands [*ca* 15 km SE of Gladstone CBD] on 19 January 2002, noted that 'Only metres away I collected several males and one female of *A. seltuttus*.' The butterflies, which were locally abundant, were filmed and collected in a coastal suburban park on the Millennium Esplanade (23°56'54"S, 151°22'34"E), where they flew and perched near an *Oecophylla* ant nest in a vine of *Cassytha* sp. (K.L. Dunn pers. comm.).

Two records of *A. seltuttus affinis* 15 years apart, at two different sites (*ca* 18 km apart) and with larval stages present in at least one of them, suggest that the butterfly is permanently established in the Gladstone district.

Acknowledgement

We thank Kelvyn Dunn for drawing our attention to the earlier record of *Anthene seltuttus* and for making available data and images for examination.

References

BRABY, M.F. 2000. *Butterflies of Australia. Their identification, biology and distribution*. CSIRO Publishing, Collingwood, Melbourne; xx + 976 pp.

BRABY, M.F. and HSU, Y.-F. 2019. Range extension for *Anthene seltuttus* (Röber, 1886) (Lepidoptera: Lycaenidae) in northeastern Australia. *Australian Entomologist* **46**: 23-26.

DUNN, K.L. 2008. New and interesting spatial and temporal butterfly records from eastern Australia. *Victorian Entomologist* **38**: 36-45.

A REDESCRIPTION OF *MYOPSALTA BINOTATA* (GODING & FROGGATT) (HEMIPTERA: CICADIDAE: CICADETTINI) FROM SOUTH AUSTRALIA, WITH FIRST DOCUMENTATION OF ITS CALLING SONG

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Abstract

Limited information has been made available on the South Australian cicada species *Myopsalta binotata* (Goding & Froggatt) since it was first described. Targeted searches during November 2016 led to the rediscovery of this species in a shrubby grassland community in northern Yorke Peninsula, about 50 km north of the type locality. This paper provides a redescription of the species with reference to the original syntypes, newly uncovered accession material in the South Australian Museum and freshly collected material. First documentation of the calling song unique to this species is also included as part of the redescription.

Introduction

There are many cases in taxonomy where species remain uncollected or poorly known since the original description (Thesen *et al.*, 2012). The chances of rediscovery can be influenced by the availability of biological information, which might be limited, especially in older taxonomic descriptions. Additionally, insects with short reproductive seasons can be difficult to find, particularly in temperate climates when poor seasons or inclement weather can dramatically reduce the chances of success (Wolda 1988). One fortunate advantage in targeted surveys for cicadas is their acoustically conspicuous, species-specific male calling songs, which provide ample means for detection when surveys are undertaken at the appropriate time (*e.g.* Ewart 2009).

The genus *Myopsalta* Moulds was introduced to accommodate eight Australian species (Moulds 2012). Since then, Emery *et al.* (2015) added two species and Popple (2017) added an additional 14. One of the species in this genus, *Myopsalta binotata* (Goding & Froggatt, 1904), has remained relatively unknown since the original description, which was based on two specimens taken from Ardrossan, Yorke Peninsula, South Australia in 1878. In late 2016, I took the opportunity to visit the South Australian Museum to check for additional material and conduct a targeted field survey for the species, which successfully led to its rediscovery near Paskeville (50 km north of the type locality). Here, I provide a redescription of *Myopsalta binotata*, including the first documentation of its distinctive calling song.

Methods and terminology

Anatomical terminology follows Moulds (2005, 2012) for body structures and wing characters, Moulds (2005) for genitalia and Dugdale (1972) and Bennet-Clark (1997) for timbals. The long timbal ribs are referred to as long ribs 1 to 5, with long rib 1 being the most posterior (adjacent to timbal plate).

The higher classification adopted in this paper follows Moulds (2012). Measurements (in mm) are given as means and ranges (in parentheses) and include the largest and smallest specimens. Head width spans across the eyes; pronotum width across the extremities of the lateral margins; abdomen width is measured across the outer edges of the auditory capsules.

Material sourced for this taxonomic work is located in collections abbreviated as follows: ANIC – Australian National Insect Collection, CSIRO, Canberra; MSM – private collection of M.S. Moulds, Kuranda; DE – private collection of D.L. Emery, Sydney; LWP – private collection of L.W. Popple, Brisbane; QM – Queensland Museum, Brisbane; SAM – South Australian Museum, Adelaide.

Genitalia preparation: Male genitalia were removed using a pair of surgical scissors and placed in a solution of 10% potassium hydroxide. The solution was left overnight at room temperature to clear the soft tissues and provide a clean dissection. Following clearing, the specimens were washed with ethanol and placed into a solution of 70%. To enable close examination of internal structures, the aedeagus was dissected for each genitalia preparation under 10x magnification. Measurements were taken using a pair of Toledo vernier calipers (accurate to 0.1 mm).

Calling song analysis: The calling song terminology used in this study has been modified from Ewart and Marques (2008). A 'pulse' was defined as a single complete movement of the timbals. The term 'syllable' was used for the smallest grouping of pulses (typically 5-10 ms duration). Where 2-9 syllables are combined, this was referred to as a 'macrosyllable'. Longer durations of continuous sound (≥10 syllables) were referred to as an 'echeme'. A period of silence following a syllable, macrosyllable or echeme was treated as a 'gap'. Where a series of (macro)syllables is produced without coalescence (*i.e.* with each (macro)syllable separated by a gap), this was referred to as a '(macro)syllable sequence'.

Field recordings have been used throughout. The combination of a Tascam DR40 with Sennheiser K6/ME66 microphone was used to obtain the recordings. All recordings were made at a distance > 20 cm from the calling insect to reduce the chances of near-field effects. None of the recordings showed signs of amplitude clipping or harmonic distortion due to microphone overload. The recording equipment exhibits a reliable frequency response up to 18 kHz. Processing and analysis of recordings was undertaken with Cool Edit Pro (Version 2.1) software. Amplitude spectra were generated using a linear frequency axis on a 1024-point Fast Fourier Transform with a Hamming window function.

Genus *Myopsalta* Moulds, 2012

Diagnosis follows Moulds (2012), with the minor extensions of Emery *et al.* (2015).

Myopsalta binotata (Goding & Froggatt, 1904)

(Figs 1-5)

Melampsalta binotata Goding & Froggatt, 1904: 625; Distant 1906: 176; Ashton 1914: 353.

Cicadetta binotata (Goding & Froggatt, 1904): Moulds 1990: 143.

Myopsalta binotata (Goding & Froggatt, 1904): Moulds 2012: 151; Popple 2017: 5.

Type material. *Syntypes*: 1 ♂ 1 ♀, Type, Ardrossan, xi.78, *Melampsalta binotata* G. &. F., S. Australia (both ANIC).

Other material. 4 ♂♂, 9.8 km W. of Paskeville, South Australia, 34°01'35"S 137°48'30"E, mixed grassland, 3.xi.2016, L.W. Popple & A. McKinnon, 293-0001, 293-0007, 293-0010, 293-0011 (all LWP); 2 ♂♂, same data as previous, 293-0004, 293-0008 (both MSM); 2 ♂♂, same data as previous, 293-0005, 293-0006 (both DE); 4 ♂♂, same data as previous, 293-0002, 293-0003, 293-0009, 293-0012 (all QM); 1 ♂, in drying grass, Hallett's Cove, 22.x.1946, H.M. Cooper, N. McFarland; 9 ♂♂ 1 ♀, S. Aust., Mokota CP nr Burra, 33°33'S 138°57'E, 16.xi.2001, pitfalls, NCS & Farrell Flat School (all SAM).

Description. Male. (Figs 1A, C, E-F). Head: Postclypeus mainly black, pale brown along lateral margins and with a pale brown medial marking when viewed from anterior side; supra-antennal plates black; genae and mandibular plates black, covered by silvery pubescence; frons black; vertex mainly black with a dull brown area extending along epicranial suture from between lateral ocelli to posterior margin; vertex and frons with sparse silvery pubescence; ocelli pale red; compound eyes brown; anteclypeus black; rostrum black, extending to posterior margins of mid coxae; antennae dark brown to black.

Thorax: Pronotum predominantly black, with pale brown central fascia not reaching anterior or posterior margins; pronotal collar black anteriorly and laterally, with dull brown posterior margins; metanotum dark brown to black; mesonotum, including submedian and lateral sigilla, black with a brown to dull brown spot on either side of midline between lateral and submedian sigilla; wing grooves and cruciform elevation dull brown to pale brown; posterior quarter of mesonotum with dense fine and mid-dense long silver pubescence.

Wings: Fore wings hyaline, with a distinct infuscation on crossveins r and r-m, extending on to intervening area of RP and proximal half of RA2; basal membranes pale grey; pterostigma grading from grey to dark brown; costal vein dark brown; other veins dark brown to black. Hind wing plagas and jugal folds white, apices hyaline; veins brown basally, dark brown to black on distal half.

Legs: Coxae pale brown, with a single, broad, dark brown fascia on each side; meracantha spikes pale brown, barely overlapping opercula; fore femora dark brown on inner sides, pale brown on outer sides, each with a dark brown fascia, spines dark brown; mid and hind femora dark brown with pale brown

bases and apices; fore tibiae dark brown; mid tibiae pale brown, each with a brown band above the base; hind tibiae pale brown, each with two weak, dark brown bands, one above base, the other towards apex; fore tarsi dark brown to black; mid and hind tarsi brown; pretarsi and claws brown.

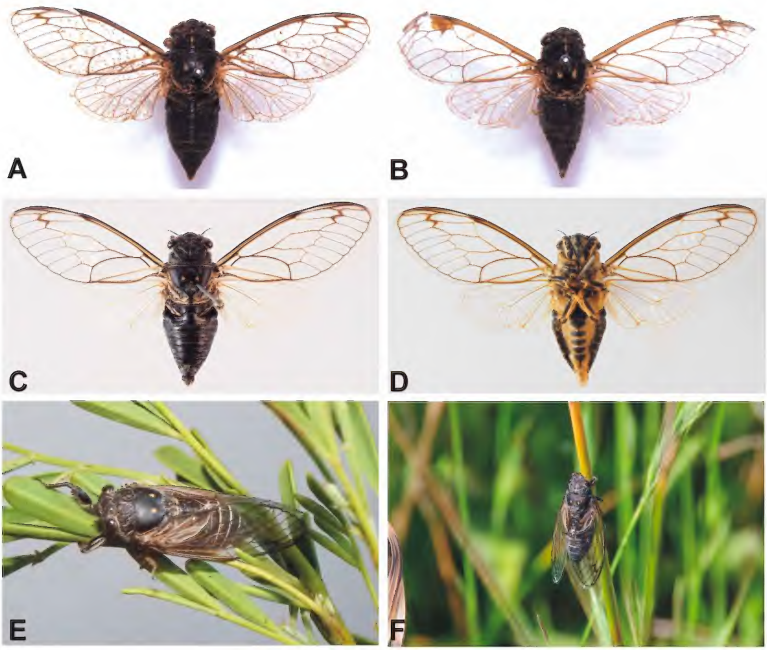

Fig. 1. *Myopsalta binotata* (Goding & Froggatt): (A) male syntype, dorsal view (body length: 17.5 mm); (B) female syntype, dorsal view (body length 15.4 mm); (C) male, 2016 specimen, dorsal view (body length 16.9 mm); (D) male, 2016 specimen, ventral view; (E) live male in captivity; (F) live male in grassland habitat (photograph A.E. McKinnon).

Opercula (Fig 2A): Broadly rounded; pale brown throughout; plates flat.

Timbals (Fig 2B): All long ribs separated ventrally; long ribs 1-4 fused to basal spur; anterior rib 5 abbreviated, unattached; prominent intercalary short ribs in medial areas between all long ribs (four in total).

Abdomen: Tergites 1-8 black, with a sparse covering of silver pubescence; intersegmental membranes brown to pale brown; epipleurites black, covered with long silver pubescence; sternites II-VI pale brown, black medially; sternite VII brown to pale brown with a black medial marking, widest anteriorly, narrowing posteriorly, not reaching posterior margin; sternite VIII pale brown; anterior sternites visible in lateral view.

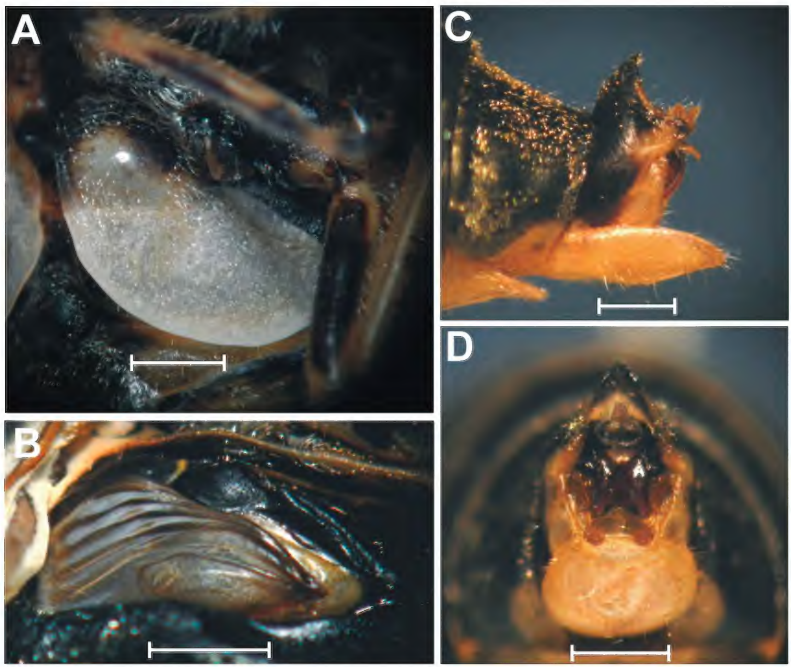

Fig. 2. *Myopsalta binotata* external anatomy: (A) right operculum; (B) left timbal; (C) pygofer, viewed laterally from left; (D) pygofer, viewed from ventral side. Scale bars = 1 mm.

Genitalia (Figs 2C-D): Pygofer mainly black, pale brown towards posterior margin; upper lobes pale brown, in lateral view broadly rounded, in ventral view slightly inward facing, with terminals directed dorsally and tapering broadly; basal lobes in ventral view and lateral view small and rounded; median lobe of uncus narrow, with apex blunt; claspers in ventral view conspicuous, diverging gradually from point of downward deflection, with apices moderately acute; pseudoparameres projecting further (ventrally) than endotheca and ventral support, showing a slight divergence apically; ventral support acute, projecting slightly beyond endotheca; endotheca sclerotised.

Female (Figs 1B, D): Head, wings and legs match description of male.

Thorax: Pronotum black, with pale brown central fascia sometimes extending to anterior and posterior margins (*i.e.* continuous with marking on head and reaching margin of pronotal collar); pronotal collar as in male. Metanotum and mesonotum as in male.

Abdomen: Tergites 1-8 black, with a sparse covering of silver pubescence; abdominal segment 9 black; dorsal beak black, sharply defined;

intersegmental membranes pale brown; sternite II black; epipleurites black; sternites III to VI mainly brown, with black wedge-shaped patterns medially, broadening posteriorly; sternite VII pale brown laterally, grading to dark brown submedially; ovipositor sheath extends < 0.5 mm beyond apex of abdominal segment 9.

Measurements (in mm; range with mean in parentheses for 13 males and 1 female, including syntypes). *Length of body*: ♂♂ 15.0-18.5 (16.77); ♀ 15.4; *length of forewing*: ♂♂ 16.5-19.7 (18.25); ♀ 18.4; *width of forewing*: ♂♂ 6.5-8.2 (7.50); ♀ 7.1; *ratio of forewing length to width* (*length/width*): ♂♂ 2.35-2.55 (2.43); ♀ 2.35; *width of head*: ♂♂ 4.3-5.1 (4.78); ♀ 4.6; *width of pronotum* (*across lateral angles*): ♂♂ 4.8-5.9 (5.29); ♀ 4.6; *width of abdomen*: ♂♂ 5.5-6.6 (6.02); ♀ 4.7; *length of ovipositor*: ♀ 4.6.

*Distinguishing features***.** *Myopsalta binotata* can be distinguished from all other species in the genus by the following combination of characters: (1) forewings hyaline, apart from a prominent infuscation on crossveins r and r-m, extending on to intervening area of RP and proximal half of RA2; and (2) mesonotum black with a brown to dull brown spot on either side of midline between the lateral and submedian sigilla.

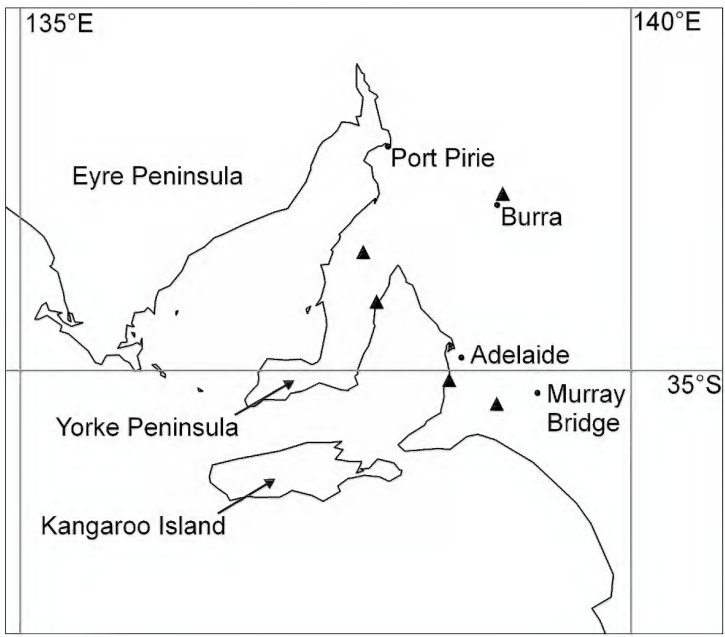

Fig. 3. Map of the Adelaide region of South Australia illustrating the known geographical distribution of *Myopsalta binotata* (closed triangles).

Distribution and habitat (Fig. 3). *Myopsalta binotata* is restricted to southeastern South Australia to the north, west and south of Adelaide. It has so far been found in the northern half of Yorke Peninsula, including Ardrossan (type locality) and in the Clare Valley near Burra, with historical records from Hallet Cove and Strathalbyn, south of Adelaide. The population most recently found at 9.8 km west of Paskeville (Yorke Peninsula, see *Other material*) occurred in a habitat containing a mixture of native and exotic grasses with scattered native shrubs (Fig. 4). This population was found to be localised to an area of < 1 ha. Notably, during early November 2016, the species could not be found elsewhere in Yorke Peninsula (including the type locality), despite extensive searches. Adults have been collected during October and November.

Fig. 4. Habitat where *Myopsalta binotata* was found in November 2016 at 9.8 km W. of Paskeville, Yorke Peninsula, South Australia (34°01'35"S, 137°48'30"E).

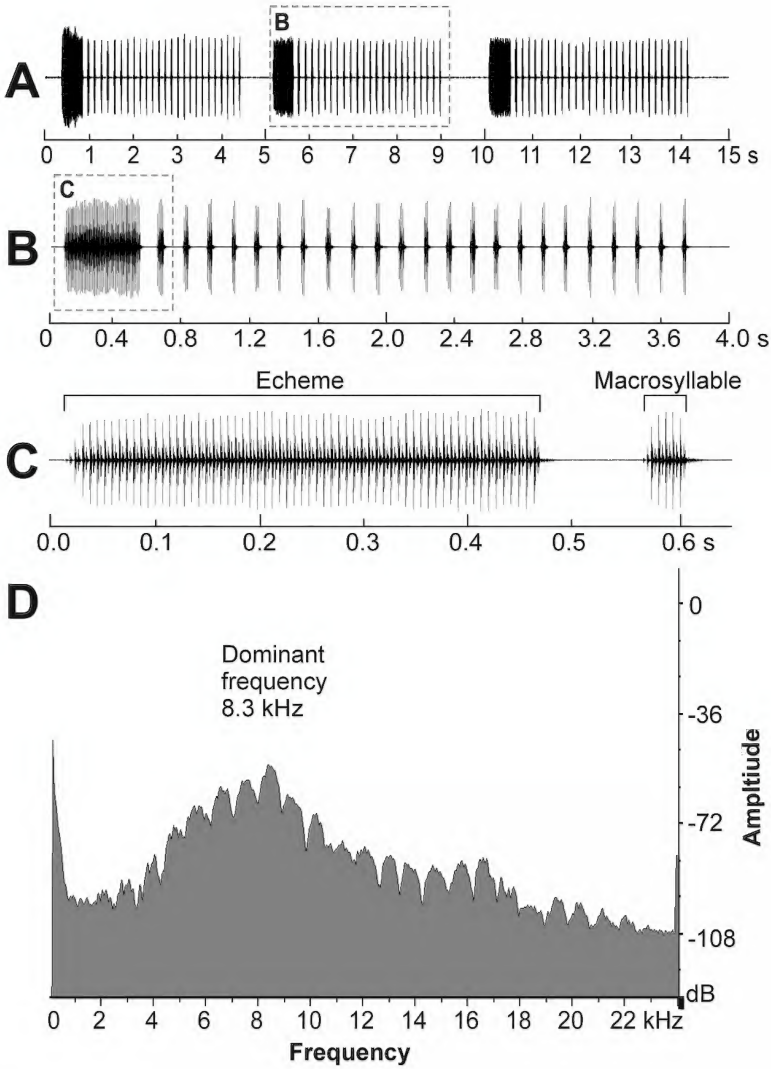

Fig. 5. Male calling song structure of *Myopsalta binotata* from a recording obtained at 9.8 km W. of Paskeville (34°01'35"S, 137°48'30"E): (A) wave plot showing three song phrases; (B) expanded wave plot showing the structure of a single phrase, including a long echeme and subsequent sequence of macrosyllables; (C) further expanded wave plot illustrating the detailed structure of the long echeme and a macrosyllable from the beginning of a phrase; (D) spectrogram showing the song frequency distribution and dominant frequency.

Calling song (Fig. 5). This description is drawn from a series of five recordings obtained at 9.8 km W. of Paskeville (34°01'35"S, 137°48'30"E). Males of this species have been observed calling in warm, sunny conditions. The calling song is composed of a series of repeated phrases, each lasting about 3-6 s. Each phrase commences with a long echeme (0.37-0.60 s duration), followed by a short gap (0.06-0.10 s) and then a series of macrosyllables (each 0.019-0.043 s, punctated by gaps of 0.08-0.22 s). The macrosyllables typically number between 21 and 24, although instances with as few as 4 and as many as 27 have also been recorded. Each phrase ends with a long gap of 0.69-1.1 s prior to commencement of the next phrase.

Closer examination of the detailed structure of the calling song reveals clearly defined pulses, with a repetition rate (measured within the long echeme) of 140-170 Hz. The calling song has a frequency plateau with the 90th percentile of amplitude power spanning 6.3-9.3 kHz and a highest amplitude dominant frequency of about 8.3 kHz.

Acknowledgements

The opportunity to undertake the targeted field survey and visit the South Australian Museum was supported by the Australian Biological Resource Study Bush Blitz Program (to Christine Lambkin; grant no. TTC215-01). I thank Anne-Marie McKinnon for assistance in the field. Beth Mantle (Australian National Insect Collection) and Peter Hudson (South Australian Museum) provided access to specimens in their care. I also thank colleagues at the Queensland Museum for equipment and support, which assisted this study.

References

ASHTON, J.H. 1914. Catalogue of the Cicadidae in the South Australian Museum with descriptions of several new species. *Transactions and Proceedings of the Royal Society of South Australia* **38**: 345-358.

BENNET-CLARK, H.C. 1997. Timbal mechanics and the control of song frequency in the cicada *Cyclochila australasiae*. *Journal of Experimental Biology* **200**: 1681-1694.

DISTANT, W.L. 1906. *A synonymic catalogue of Homoptera. Part 1. Cicadidae*. British Museum, London; 207 pp.

DUGDALE, J.S. 1972. Genera of New Zealand Cicadidae (Homoptera). *New Zealand Journal of Science* **14**: 856-882.

EMERY, N.J., EMERY, D.L. and POPPLE, L.W. 2015. Redescription of *Myopsalta atrata* (Goding and Froggatt) and description of two new species of *Myopsalta* Moulds (Hemiptera: Cicadidae) from central western New South Wales. *Records of the Australian Museum* **67**: 185-189.

EWART, A. 2009. Cicadas of the eastern segment of the Cravens Peak Reserve, northeastern Simpson Desert, S.W. Queensland, January/February 2007, in: Freemantle, H. (ed.), *Cravens Peak xcientific study report. Geography Monograph Series* **13**: 117-150. The Royal Geographical Society of Queensland Inc., Brisbane.

EWART, A. and MARQUES, D. 2008. A new genus of grass cicadas (Hemiptera: Cicadoidea: Cicadidae) from Queensland, with descriptions of their songs. *Memoirs of the Queensland Museum* **52**: 149-202.

GODING, F.W. and FROGGATT, W.W. 1904. Monograph of the Australian Cicadidae. *Proceedings of the Linnean Society of New South Wales* **29**: 561-670.

MOULDS, M.S. 1990. *Australian cicadas*. New South Wales University Press, Kensington; 217 pp.

MOULDS, M.S. 2005. An appraisal of the higher classification of cicadas (Hemiptera: Cicadoidea) with special reference to the Australian fauna. *Records of the Australian Museum* **57**: 375-446.

MOULDS, M.S. 2012. A review of the genera of Australian cicadas (Hemiptera: Cicadoidea). *Zootaxa* **3287**: 1-262.

POPPLE, L.W. 2017. A revision of the *Myopsalta crucifera* (Ashton) species group (Hemiptera: Cicadidae: Cicadettini) with 14 new species from mainland Australia. *Zootaxa* **4340**: 1-98.

THESSEN, A.E., PATTERSON, D.J. and MURRAY, S.A. 2012. The taxonomic significance of species that have only been observed once: The genus *Gymnodinium* (Dinoflagellata) as an Example. *PLoS ONE* **7**: e44015.

WOLDA, H. 1988. Insect seasonality: why? *Annual Review of Ecology and Systematics* **191**:1-18.

A NEW GENUS AND SPECIES OF CYBOCEPHALIDAE (COLEOPTERA) FROM AUSTRALIA

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Abstract

Eupastillus minimus **gen. & sp. n.** from northern Queensland is described and figured. Characters are given to distinguish this genus from all other described genera of Cybocephalidae and comments are made concerning the systematic position and rank of the family and its occurrence in Australia.

Introduction

Cybocephalidae are a more or less cosmopolitan family of minute beetles containing about 175 species in 12 extant genera plus one from the Lower Eocene (Kirejtshuk and Mantic 2015). Because these beetles are minute (0.8-2.6 mm) and capable of conglobation, they are sometimes mistaken for members of the unrelated family Clambidae. The adults differ from clambids in many respects, the most obvious of which are the presence of tarsal lobes in cybocephalids but not clambids and the presence of enlarged metacoxal plates in clambids but not cybocephalids. Although the vast majority of described cybocephalids belong to the widely distributed genus *Cybocephalus* Erichson, several other genera have been described from Central and South America (*Pycnocephalus* Sharp, 1891), Argentina and Uruguay (*Amedissia* Kirejtshuk & Mantik, 2015), western North Africa (*Pastillodes* Endrödy-Younga, 1968), North Africa and Central Asia (*Theticephalus* Kirejtshuk, 1988), Madeira and Canary Islands (*Hierronius* Endrödy-Younga, 1968), French Eocene (*Pastillocenicus* Kirejtshuk & Nel, 2008), Japan (*Apastillus* Kirejtshuk & Mantič, 2015), Micronesia (*Pacicephalus* Kirejtshuk & Mantič, 2015), Southeast Asia (*Taxicephomerus* Kirejtshuk, 1994), Central and Southern Africa (*Pastillus* Endrödy-Younga, 1962 and *Horadion* Endrödy-Younga, 1976) and Madagascar (*Endroediellus* Endrödy-Younga, 1962). The taxon described below from tropical North Queensland is the first endemic Australian genus.

The biology of most species of cybocephalids is not known but it is likely that most species are predaceous on a variety of sternorrhynchan Hemiptera, such as Diaspididae, Coccidae, Pseudococcidae and Aleyrodidae, although some species are known to feed on mites (Tanaka and Inoue 1980). Most larval descriptions and detailed biological observations have been based on species of *Cybocephalus* preying on armoured scale insects (Diaspididae) (Blumberg 1974, Böving and Craighead 1931, Hayashi 1978, De Marzo 1995, Lupi 2003, Silvestri 1910, Vinson 1959), but there are at least some records of predation on Pseudococcidae (*C. californicus* Horn on cypress bark scale, *Ehrhornia cupressi* (Ehrhorn): Parker 1951).

Another major group of hosts are the whiteflies (Aleyrodidae). Clausen and Berry (1932) reported a Javanese species of *Cybocephalus* attacking the citrus blackfly, *Aleurocanthus woglumi* Ashby, while Vinson (1959) observed *Cybocephalus semiflavus* Champion attacking *Stenaleyrodes vinsoni* Takahashi on palms in Reunion, and Kirejtshuk, James and Heffer (1997) described a new species, *C. aleurodiphagus*, important in the biological control of *Orchamoplatus citri* (Takahashi), the Australian citrus whitefly. The genus *Amedissia* was reported by Parker (1951) feeding on a species of *Ceroplastes* Gray (wax scales: Coccidae).

The phylogenetic position of the Cybocephalidae has been disputed in recent years. Although the group was considered to be a family by Endrödy-Younga (1962a, b, 1967, 1968, 1971a, b, 1976) and is recognised as such in recent works by Smith and Cave (2006, 2007a, b) and Hisamatsu (2013). Kirejtshuk (1986, 1992, 1994, 1996, 2008) considered this group to be a nitidulid subfamily and argued his case in detail in Kirejtshuk and Mantič (2015). Various general works, such as Lawrence and Newton (1995) and Jelinek *et al*. (2010), followed Kirejtshuk's placement. The work by Cline *et al.* (2014) used DNA sequence data to elucidate phylogenetic relationships for 29 nitidulid genera belonging to seven subfamilies, plus *Cybocephalus*, *Anthonaeus* Horn (Kateretidae) and 12 genera belonging to three families of Cleroidea, four families of Cucujoidea and two families of Coccinelloidea. Although it is obvious in their cladogram that *Cybocephalus* is well removed from the kateretid-nitidulid clade, its placement in the same clade as the cucujoid family Sphindidae, which is in turn sister to a clade containing three genera now placed in Coccinelloidea (Robertson *et al.* 2015), casts some doubt on the analysis. Kirejtshuk and Mantič (2015) devoted several pages to a criticism of Cline's conclusions, which I will not repeat in detail except to say that many of their arguments were not phylogenetic and some were reactions to the placement of the group in a clade containing Coccinelloidea. I agree with these authors that the cybocephalid aedeagi are similar to those of many Nitidulidae and the genital capsule resembles those of nitidulids (except perhaps for the absence of a ventral plate). They also point out the loss of the maxillary galea in both nitidulids and cybocephalids. Kirejtshuk (1986, 1995) considered cybocephalids to be members of the derived 'nitidulin lineage' containing the subfamilies Meligethinae, Nitidulinae, Cillaeinae and Cryptarchinae, as well as Cybocephalinae, and the group was included in the subfamily Nitidulinae by Leschen (1999).

A possible recent solution to the placement of this group can be found in a broader DNA analysis by Zhang *et al.* (2018). In their cladogram, *Cybocephalus* formed a clade with *Notobrachypterus* Blackburn (Kateretidae) and this clade was sister to one containing five nitidulid genera in four subfamilies. I consider the results of this analysis, with Cybocephalidae sister to Kateretidae and the two forming a sister clade to Nitidulidae, to be more reasonable.

The aedeagi of kateretids and nitidulids are certainly similar and, given the minute size of cybocephalids, the independent loss of the maxillary galea is not surprising.

The Australian Cybocephalidae are still poorly known. In addition to *C. aleyrodiphagus* mentioned above, two other *Cybocephalus* species were originally included in the genus *Clambus* Fischer von Waldheim (Clambidae): *C. australiae* (Lea, 1926a) and *C. semiflavus* (Lea, 1926b), the latter renamed *C. leai* Endrödy-Younga, 1974. There are a number of Australian species awaiting dscription in this genus.

Materials and methods

Morphological terms and conventions discussed in detail for Nitidulidae by Lawrence and Kirejtshuk (2019) apply equally well to members of this related group. Habitus illustrations in Figs 1 and 2 were produced with BK Lab Plus system (*http://www.duninc.com*); source images were then aligned and stacked in Zerene Stacker and edited in Photoshop. All other figures of morphological details are based on photomicrographs of specimens in glycerine made with a Dino-Eye AM4023XC Eyepiece Camera attached to a Leitz Wetzlar compound microscope with 10X and 32X objectives and DinoCapture 2.0 software. These images were basically snapshots and did not involve image stacking.

Systematics

Eupastillus minimus gen. & sp. n.

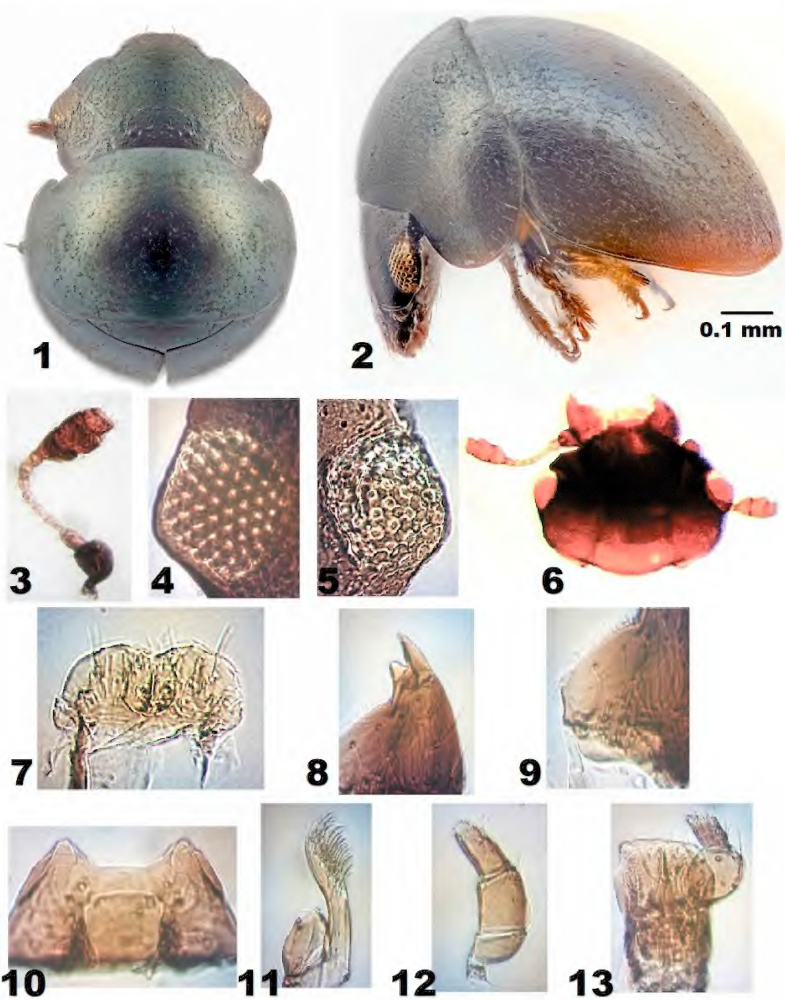
(Figs 1-26)

Type material. Holotype, sex ?, QUEENSLAND: 12.39S 142.42E, 4 km NE Batavia Downs, 22 Jun - 23 Aug 1992, flight intercept trap, P. Zborowski & J. Cardale (ANIC, Type No. 25-06765). *Paratypes*: QUEENSLAND: 8, Batavia Downs, 4 km NE (12°38'S, 142°42'E), 22.vi-23.viii.1992, flight intercept trap, P. Zborowski, J. Cardale (ANIC, QMB); 1, same locality, 18.vi-22.viI.1992, flight intercept trap, P. Zborowski & E.S. Nielsen (ANIC); 3, same locality, 22.viii-16.ix.1992, flight intercept trap, P. Zborowski & L. Miller (ANIC); 1, same locality, 16.ix-24.x.1992, flight intercept trap, P. Zborowski & T. Weir (ANIC).

Diagnosis. Eupastillus minimus **sp. n.** differs from species of *Amedissia, Cybocephalus, Endroediellus, Horadion, Pacicephalus, Pycnocephalus, Taxicephomerus* and *Theticephalus* in having a reduced metaventrite, distinctly shorter than the mesoventite, and from *Amedissia, Horadion, Pacicephalus, Theticephalus* and *Apastillus* in its 11-segmented antennae. *Eupastillus* also differs from: 1) *Amedissi*a in the concealed abdominal apex, metaventrite shorter than abdominal ventrite 1, non-metallic upper surfaces, non-emarginate lateral pronotal edges and non-crenulate ventrite 5; 2) *Apastillus* in the 3-segmented antennal club, widely separated metacoxae, non-emarginate apex of ventrite 1 and non-metallic upper surfaces; 3) *Cybocephalus* in the dilated meso- and metatibiae; 4) *Endroediellus* in the

slightly longer and narrower head and the metafemur more than twice as long as wide; 5) *Hierronius* in the postmetacoxal lines reaching the posterior edge of ventrite 1, metaventrite without a transverse excavation and abdominal ventrite 1 not much longer than metaventrite; 6) *Horadion* in having terminal antennomere reduced in size but not concealed within previous one and tibial apices more or less dilated apically and rounded at apex; 7) *Pacicephalus* in having metaventrite much shorter than mesoventrite, antennal club well defined and outer apical angle of protibia rounded, without tooth; 8) *Pastillocenicus* in having distinct postcoxal lines on abdominal ventrite 1, distinct antennal club clearly separated from funicle, metacoxae less widely separated and metatibia distinctly expanded; 9) *Pastillus* in having mesocoxae transverse, not oblique, metaventrite without impressions for hind legs and abdominal ventrite 1 with postcoxal lines; 10) *Pycnocephalus* in having antennomere 2 elongate, not globular, outer edge of protibia not crenulate, protibial apex rounded and size much smaller; and 11) *Taxicephomerus* in having the body less than twice as long as wide, colour not metallic blue, meso- and metatibiae dilated and protibiae rounded at apex (not produced and acute).

Description. Length (excluding head) 0.65-0.95 (0.76 ± 0.08) mm; body very short, broad and capable of conglobation, so that the head is usually posteriorly oriented and extends as far as the base of the abdomen (Figs 1-2); body length 1.00-1.26 (1.14) times as long as elytral width; greatest depth 0.37-0.65 (0.59) times elytral width; in lateral view, pronotoelytral junction the highest point on dorsal surface, with pronotum and elytra strongly declined. Colour of exposed surfaces entirely black; dorsal surfaces subglabrous (very sparsely clothed with minute setae), most ventral surfaces and legs clothed with moderately long setae. Head (Fig. 6) 0.80 times as long as wide; eyes 0.20 times as long as head width, each extending onto the ventral surface but partly covered both dorsally and ventrally with a thin layer of cuticle (Figs 4-5); distance across eyes 1.38 times distance between them; clypeus extending well in front of eyes, broadly rounded apically. Antennae (Fig. 3) about 0.7 times as long as head width, 11-segmented with 3-segmented club; scape slightly longer than wide, slightly asymmetrical; club about 0.8 times as long as antennomeres 3-8 combined, 2.28 times as long as wide; apical antennomere distinctly shorter and narrower than preapical one. Labrum (Fig. 7) 0.4 times as long as wide, sides strongly curved, converging; apex broadly but weakly emarginate. Mandible (Figs 8-9) 1.5 times as long as wide, outer edge evenly curved, apex unidentate, with shorter but well developed subapical tooth; mola absent but replaced by a hyaline, acute process; prostheca a row of short setae. Lacinia (Fig. 11) slender, curved, narrowly rounded at apex with a large obliquely oval patch of dense setae; apical maxillary palpomere (Fig. 12) 1.88 times as long as wide, as long as but distinctly narrower than preapical palpomere, parallel-sided, with subtruncate apex. Mentum (Fig. 10) 0.45 times as long as wide,

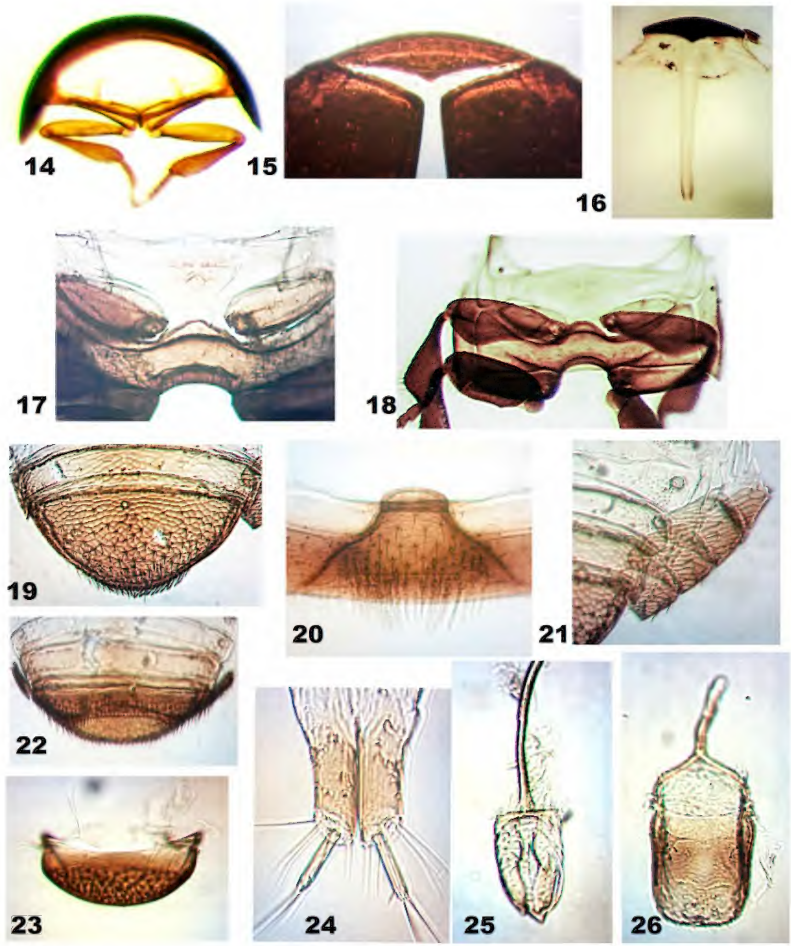


Figs 1-13. *Eupastillus minimus* **sp. n.**: (1-2) habitus, posterodorsal and lateral views; (3) antenna; (4) eye, dorsal; (5) eye, ventral; (6) head, dorsal; (7) labrum; (8) mandible, apex; (9) mandible, base; (10) mentum; (11) lacinia; (12) maxillary palp; (13) prementum and one labial palp.

widest at base; sides straight and converging; apex deeply and broadly emarginate forming a pair of subacute lobes. Apical labial palpomere (Fig. 13) 1.57 times as long as wide, parallel-sided, apically truncate and distinctly narrower than globular preapical palpomere.

Pronotum 0.32-0.43 (0.36) times as long as wide with anterior angles produced and broadly rounded and with sides and posterior edge forming a continuous curve. Prosternum (Fig. 14) about 0.5 times as long as procoxal cavity, which is strongly transverse; prosternal process about 0.3 times as wide as length of procoxal cavity, parallel-sided with narrowly rounded apex. Scutellar shield (Figs 1, 15-16) about 0.50 times as wide as pronotum and 0.26 times as long as wide, more or less angulate at apex; metatergal alacrista (Fig. 16) extending posteriorly to base of abdomen. Elytra 0.62-0.92 (0.79) times as long as wide and 1.45-2.77 (2.26) times as long as pronotum; sides more or less evenly rounded, apices conjointly rounded, not exposing pygidium; punctation very fine and sparse; epipleura very narrow and ending at about middle. Anterior edge of mesoventrite (Figs 17-18) on a lower plane than metaventrite, its anterior edge and surface simple and lightly sclerotised; mesocoxae very slightly oblique, separated by distance equal to shortest diameter of mesocoxal cavity, partly closed laterally by mesepimeron. Metaventrite (Figs 17-18) 0.14 times as long as wide, without discrimen; anterior lobe broadly rounded and abruptly declined to meet posterior edge of mesoventrite; surface of metaventrite with pair of straight, oblique lines beginning at the mesal edges of the metacoxal cavities and extending anterolaterally but ending well before the lateral edge of the ventrite. Metacoxae separated by 1.20 times longitudinal (shortest) diameter of metacoxa. Metanepisternum about 6 times as long as wide, widest at middle and strongly narrowed anteriorly. Profemur (Fig. 14) 2.8 times as long as wide, with very narrow tibial groove; protibia 4.5 times as long as wide, slightly expanded to apical third, curved and narrowed to apex; outer edge lined with a few setae near apex. Mesofemur (Fig. 18) 1.86 times as long as wide, widest at apical third, with distinct tibial groove; mesotibia 2.10 times as long as wide, distinctly expanded to apical fifth, which is angulate, then narrowed to apex, outer edge completely lined with erect setae. Metafemur 2.00 times as long as wide, not distinctly expanded, almost parallel-sided; outer edge with small tooth at basal third in male; metatibia 2.44 times as long as wide, slightly expanded to apical third, which is rounded and narrowed to apex; outer edge completely lined with erect setae. Tarsi 4-4-4; basal 3 tarsi at least slightly lobed beneath and setose; claws small and simple.

Abdomen with ventrite 1 (Fig. 20) about twice as long as 2, 3 or 4 and slightly longer than 5, intercoxal process apically truncate; postcoxal lines more or less straight, extending from mesal edges of metacoxae almost to posterior edge of ventrite; apex of ventrite 5 (sternite VII) broadly rounded.in female, broadly emarginate in male to receive tergite VIII (Figs 22-23). Pygidium (Fig. 19) broadly rounded at apex. Tegmen (Fig. 26) 1.33 times as long as wide, sides subparallel, apex broadly rounded; tegminal strut as long as body of tegmen.



Figs 14-26. *Eupastillus minimus* **sp. n.**: (14) prothorax, anterior; (15) scutellum and elytral bases; (16) scutellar shield and metanotal alacrista; (17) mesal portions of meso- and metaventrites; (18) meso- and metaventrites, with legs attached; (19) pygidium; (20) abdominal ventite 1; (21) abdominal segments IV–VIII, showing spiracles on tergites V and VI; (22) abdominal sternite VII, with tergites VI and VII in background; (23) sternite VIII; (24) ovipositor apex, showing gonocoxites and gonostyli; (25) penis; (26) tegmen.

Penis (Fig. 25) subequal in length to tegmen and 1.82 times as long as wide; sides more or less parallel to apical fourth, then converging to acute apex; penile strut 1.85 times as long as tegmen.

Ovipositor (Fig. 24) 2.53 times as long as wide, widest at base; paraprocts 1.53 times as long as gonocoxites, which are 1.9 times as long as combined width, fused together and lightly sclerotised basally, with apical portions free, contiguous and moderately well sclerotised with truncate apices; gonostyli about 0.3 times as long as gonocoxite, parallel-sided and 5 times as long as wide.

Etymology. The species' name is derived from its small size.

Distribution. Known only from the type locality in northern Queensland.

Acknowledgments

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References

BLUMBERG, D. 1974. The development and reproduction of cybocephalid beetles on various foods. *Entomophaga* **19**(4): 437-443.

BÖVING, A.G. and CRAIGHEAD, F.C. 1931. An illustrated synopsis of the principal larval forms of the order Coleoptera. *Entomologia Americana* (new series) (1930) **11**: 1-351.

CLAUSEN, C.P. and BERRY. P.A. 1932. The citrus blackfly in Asia, and the importation of its natural enemies into Tropical America. *United States Department of Agriculture Technical Bulletin* **320**: 59 pp.

CLINE, A.R., SMITH, T.R., MILLER, K., MOULTON, M., WHITING, M. and AUDISIO, P. 2014. Molecular phylogeny of Nitidulidae: assessment of subfamily and tribal classification and formalization of the family Cybocephalidae (Coleoptera: Cucujoidea). *Systematic Entomology* **39**(4): 758-772.

DE MARZO, L. 1995. Appunti sulla presenza di *Cybocephalus rufifrons* Reitt. in Suditalia (Coleoptera: Cybocephalidae). *Entomologica, Bari* **29**: 135-147.

ENDRÖDY-YOUNGA, S. 1962a. Neue Cybocephaliden Gattungen aus der aethiopischen Region (Col. Cybocephalidae). *Annales historico-naturales Musei Nationalis Hungarici* **54**: 271-277.

ENDRÖDY-YOUNGA, S. 1962b. Die aethiopischen Arten der Gattung *Cybocephalus* Er. (Col. Cybocephalidae). *Acta Zoologica Academiae Scienciarum Hungarici* **8**: 335-384.

ENDRÖDY-YOUNGA, S. 1967. 51. Familie: Cybocephalidae, pp 77-79, in: Freude, H., Harde, H.K.W. and Lohse, G.A. (eds), *Die Käfer Mitteleuropas. Band 7. Clavicornia.* Goecke & Evers, Krefeld.

ENDRÖDY-YOUNGA, S. 1968. Monographie der paläarktischen Arten der Familie Cybocephalidae (Coleoptera: Clavicornia). *Acta Zoologica Academiae Scientiarum Hungaricae* **14**: 27-115.

ENDRÖDY-YOUNGA, S. 1971a. Cybocephalidae. Coleoptera. *Insect of Micronesia* **16**: 281-285.

ENDRÖDY-YOUNGA, S. 1971b. Neue Ergebnisse bei der Bearbeitung der paläarktischen und orientalischen Cybocephalidae (Coleoptera: Clavicornia). *Acta Zoologica Academiae Scientiarum Hungaricae* **17**: 243-249.

ENDRÖDY-YOUNGA, S. 1976. Some new Aethiopian species of the family Cybocephalidae (Col. Clavicornia). *Annales de la Société Entomologique de France* (N.S.) **12**: 113-122.

HAYASHI, N. 1978. A contribution to the knowledge of the larvae of Nitidulidae occurring in Japan (Coleoptera: Cucujoidea). *Insecta Matsumurana* (new series) **14**: 1-94.

HISAMATSU, S. 2013. A review of the Japanese Cybocephalidae (Coleoptera: Cucujoidea). *Zootaxa* **3616**(3): 253-267.

JELINEK, J., CARLTON, C.E., CLINE, A.R. and LESCHEN, R.A.B. 2010. 10.26. Nitidulidae Latreille, 1802. Pp 390-407, in: Leschen, R.A.B., Beutel, R.G. and Lawrence, J.F. (eds), *Handbuch der Zoologie/Handbook of Zoology. Band/Volume IV Arthropoda: Insecta Teilband/Part 38. Coleoptera, Beetles. Volume 2. Morphology and Systematics* (*Polyphaga partim*). W. De Gruyter, Berlin; xiv + 786 pp.

KIREJTSHUK, A.G. 1986. Analysis of structure of genitalia for reconstruction of phylogeny and substantiation of the system of the family of sap beetles (Nitidulidae, Coleoptera). *Trudy Vsesoyuznogo Entomologicheskogo Obtchestva* **68**: 22-28 (in Russian).

KIREJTSHUK, A.G. 1988. New taxa of the Nitidulidae (Coleoptera) of the Eastern Hemisphere. Part 2. *Trudy Zoologicheskogo Instituta Akademia Nauk SSSR* **178**: 62-97 (in Russian).

KIREJTSHUK, A.G. 1992. 59, 61. Fam. Nitidulidae. Pp 114-209, in: Ler, P.A. (ed.), *Key to the Insects of the Russian Far East. Vol. III. Part 2*. Dal'nauka, Vladivostok; 704 pp (in Russian).

KIREJTSHUK, A.G. 1994a. New species and notes on taxonomy of the nitidulid species (Coleoptera) of Indochina and adjacent territories. Part 2. *Trudy Zoologicheskogo Instituta Akademia Nauk SSSR* **257**: 92-127 (in Russian).

KIREJTSHUK, A.G. 1994b. System, evolution of the way of life, and phylogeny of the order Coleoptera I. *Entomologicheskoye Obozreniye* **73**(2): 266-268 (in Russian; translation in *Entomological Review* **74**(3): 12-31).

KIREJTSHUK, A.G. and MANTIČ, M. 2015. On systematics of the subfamily Cybocephalinae (Coleoptera: Nitidulidae) with descriptions of new species and generic taxa. *Proceedings of the Zoological Institute RAS* **319**(2): 196-214.

KIREJTSHUK, A.G. and NEL, A. 2008. New beetles of the suborder Polyphaga from the Lowermost Eocene French amber (Insecta: Coleoptera). *Annales de la Société Entomologique de France* **44**(4): 419-442.

KIREJTSHUK, A.G., JAMES, D.G. and HEFFER, R. (1997) Description and biology of a new species of *Cybocephalus* (Coleoptera: Nitidulidae), a predator of Australian citrus whitefly. *Australian Journal of Entomology* **36**: 81-86.

LAWRENCE, J.F. and KIREJTSHUK, A.G. 2019. Review of the Australian Cyllodini (Coleoptera: Nitidulidae: Nitidulinae), with descriptions of new taxa, and notes on the genus *Macleayania* (Nitidulini). *Zootaxa* **4544**(3): 301-334.

LAWRENCE, J.F. and NEWTON, A.F. 1995. Families and subfamilies of Coleoptera (with selected genera, notes, references and data on family-group names). Pp 779-1006, in: Pakaluk, J. and Slipinski, S.A. (eds), *Biology, phylogeny, and classification of Coleoptera. Papers celebrating the 80th birthday of Roy A. Crowson.* Muzeum I Instytut Zoologi PAN, Warsaw.

LEA, A.M. 1926a. Notes on some miscellaneous Coleoptera, with descriptions of new species. Part VI. *Transactions of the Royal Society of South Austr*alia **50**: 45-85.

LEA, A.M. 1926b. On some Australian Coleoptera collected by Charles Darwin during the voyage of the "Beagle". *Transactions of the Entomological Society of London* **1926**(2): 279-288.

LESCHEN, R.A.B. 1999. Systematics of Nitidulinae (Coleoptera: Nitidulidae): phylogenetic relationships, convexity and the origin of phallalophagy. *Invertebrate Taxonomy* **13**: 845-882.

LUPI, D. 2003. Contribution to the knowledge of cybocephalid beetles. Biology and ethology of *Cybocephalus freyi* Endrödy-Younga. *Bolletino di Zoologia agraria e di Baccicoltura*, Ser. II, **35**(1): 45-54.

PARKER, H.L. 1951. Notes on *Pycnocephalus argentinus* Brethes, parasitic on *Ceroplastus* sp. in Uruguay. *Proceedings of the Entomological Society of Washington* **53**(1): 35-41.

ROBERTSON, J.A., ŚLIPIŃSKI, A., MOULTON, M., SHOCKLEY, F.W, GIORGI, A., LORD, N.P., MCKENNA, D.D., TOMASZEWSKA, W., FORRESTER, W., MILLER, J., WHITING, K.B. and MCHUGH, J.V. 2015. Phylogeny and classification of Cucujoidea and the recognition of a new superfamily Coccinelloidea (Coleoptera: Cucujiformia). *Systematic Entomology* **40**(4): 745-778.

SHARP, D. 1891. Fam. Nitidulidae. Pp 265-387, in: Godman, F.D. and Salvin, O. (eds), *Biologia Centrali-Americana. Insecta. Coleoptera. Vol. 2, Part 1.* Porter, London.

SILVESTRI, F. 1910. Metamorfosi del *Cybocephalus rufifrons* Reitter e notizie sui suoi costumi. *Bolletino del Laboratorio di Zoologia Generale e Agraria della R. Scuola Superiore d'Agricoltura in Portici* **4**: 221-227.

SMITH, T.R. and CAVE, R.D. 2006. Life history of *Cybocephalus nipponicus* Endrödy-Younga (Coleoptera: Cybocephalidae), a predator of *Aulacaspis yasumatsui* Takagi (Hemiptera: Diaspididae). *Proceedings of the Entomological Society of Washington* **108**(4): 905-916.

SMITH, T.R. and CAVE, R.D. 2007a. The Cybocephalidae (Coleoptera) of America north of Mexico. *Annals of the Entomological Society of America* **99**(5): 776-792.

SMITH, T.R. and CAVE, R.D. 2007b. The Cybocephalidae (Coleoptera) of the West Indies and Trinidad. *Annals of the Entomological Society of America* **100**(2): 164-172.

SMITH, T.R. and CAVE, R.D. 2007c. The Cybocephalidae (Coleoptera) of Mexico. *Annals of the Entomological Society of America* **100**(6): 839-849.

TANAKA, M. and INOUE, K. 1980. Biology of *Cybocephalus nipponicus* Endroy Yonga (Cybocephalidae) and its role as a predator of citrus red mites, *Panonychus citri* (McGregor). *Bulletin of the Fruit Tree Research Station, Japan, D (Kuchinotsu)*, (2), 91-110.

VINSON, J. 1959. The genus *Cybocephalus* Erichson in the Mascarene Islands (Coleoptera: Nitidulidae). *Proceedings of the Royal Entomological Society of London*, Series B, **28**(1-2): 7-18.

ZHANG, S.-Q., CHE, L.-H., LI, Y., LIANG, D,, PANG, H., SLIPINSKI, A. and ZHANG, P. 2018. Evolutionary history of Coleoptera revealed by extensive sampling of genes and species. *Nature Communications* **9**: 205, 1-11. DOI: 10.1038/s41467-017-02644.

A NEW SUBSPECIES OF *RUGITARUS PUELLARUM* BAEHR, 2009 (COLEOPTERA: CARABIDAE: LEBIINI) FROM NEW SOUTH WALES, AUSTRALIA

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(*Deceased April 17, 2019*)

Abstract

A new subspecies of the lebiine species *Rugitarus puellarum* Baehr, 2009 is described from eastern New South Wales, Australia: *Rugitarus puellarum bivittatus* **subsp. n.** It differs from all other subspecies by its wide, markedly cordiform prothorax and the bivittate elytra and is placed into the previous key to subspecies.

Introduction

During revision of some subgenera of the lebiine genus *Anomotarus* Chaudoir, 1875, the genus *Rugitarus* Baehr, 2009 was established for a number of populations of a species that, although morphologically divergent and very specialised, was considered to be related to the anomotarine lineage (Baehr 2009). Among Australian Carabidae sent from the Queensland Museum, Brisbane for identification was a single specimen of *R. puellarum* Baehr from central-eastern News South Wales, which clearly differs from the seven subspecies recognised by Baehr (2009). It is described here as an additional subspecies.

Material and methods

For the taxonomic treatment standard methods were used. The genitalia were removed from the specimen after relaxing overnight in a jar under moist atmosphere, then cleaned for a short while in hot 10% KOH. Photographs were taken by a digital camera using ProgRes CapturePro 2.6 and AutoMontage and edited with Corel Photo Paint X4.

Measurements were taken using a stereo microscope with an ocular micrometer. Length was measured from the anterior margin of the labrum to the apex of the elytra. Length of pronotum was measured along midline. Length of elytra was taken from the most advanced part of the humerus to the most advanced part of the apex.

Abbreviations: ACT – Australian Capital Territory; NSW – New South Wales; NT – Northern Territory; QLD – Queensland; SA – South Australia; VIC - Victoria; WA – Western Australia; c. –central; ce. – central-eastern; e. – eastern; n. – northern; ne. – northeastern; nw. – northwestern; se. – southeastern; sw. – southwestern; w. – western; > – larger or longer than; < – smaller or shorter than.

Genus *Rugitarus* Baehr, 2009

Rugitarus Baehr, 2009: 142. Type species *Rugitarus puellarum* Baehr, 2009, by monotypy.

Diagnosis. Medium-sized, depressed species with elongate, more or less erect pilosity on the dorsal surface, further characterised by: rather quadrate, basally wide head, six-setose labrum; presence of several longitudinal sulci medially of the eye; coarse punctation on the whole surface; presence of a distinct mental tooth; moderately securiform labial palpus in both sexes; rather short antenna with median antennomere length about 1.5 x width; pronotum wide, cordiform, more or less densely punctate-striolate; elytra rather short, depressed, apically widened, with evenly convex apex; striae complete, coarsely punctate; intervals punctate; metathoracic wings fully developed; ventral surface completely pilose; microreticulation absent; terminal sternum 4-setose to 8-setose in both sexes; legs moderately elongate; tarsal claws denticulate; aedeagus rather narrow and elongate with short ostium and a very elongate, basally incurved sclerotised rod in the internal sac; female gonocoxites comparatively short with bisetose apex of gonocoxite 2.

A single widespread, quite variable species, distributed over much of continental Australia except the centre and the south-west (Fig 1), so far provisionally divided into seven subspecies with an eighth described here.

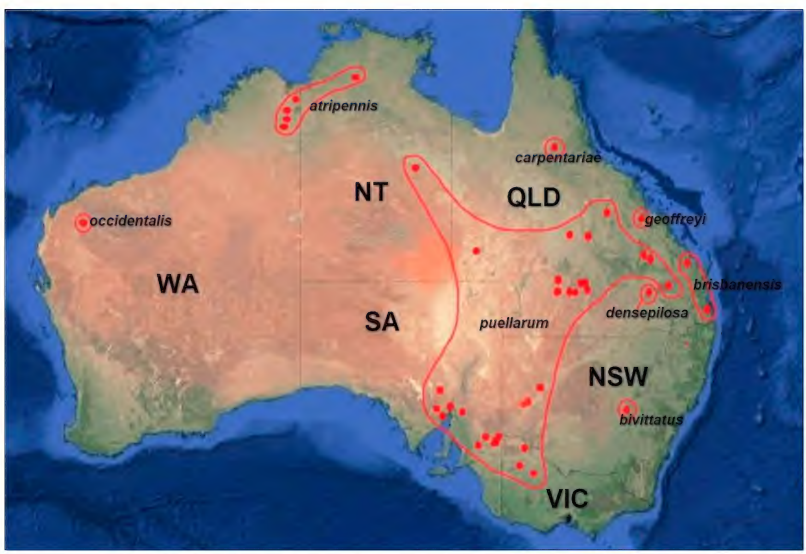


Fig. 1. *Rugitarus puellarum*: map of known localities (red spots within named perimeter lines) for the eight recorded subspecies.

***Rugitarus puellarum* Baehr, 2009**

Rugitarus puellarum Baehr, 2009: 142. Type locality Lyrup Flats, 4 km SE of Berri, South Australia.

This widely distributed species varies to some degree in certain character states of external and genitalic morphology and apparently has evolved a number of geographically separated populations that have been provisionally described as subspecies. They differ in characters of body shape, surface structure, coloration and in shape of the aedeagus. Some of these forms are better characterised than others and might be raised to specific rank in future, if additional evidence becomes available from examination of more material and/or by application of molecular methods.

Revised key to the subspecies of *Rugitarus puellarum* Baehr

1 Whole surface with very dense and elongate pilosity, in particular the margins of pronotum and elytra with a conspicuous fringe of elongate, horizontally directed setae; base of pronotum very wide, ratio widest diameter/base 1.16-1.19; elytra elongate, uniformly brown; aedeagus unknown. se. QLD w. of Great Dividing Range …… …….. *densepilosa* Baehr, 2009

– Pilosity less dense and elongate, margins of pronotum and elytra without conspicuous fringe of elongate, horizontally directed setae; base of pronotum narrower, pronotum more cordiform, ratio widest diameter/base >1.19, commonly more; elytra either shorter or with colour pattern ……. 2

2 Eye comparatively large, >1.5 x as long as orbit. n. QLD, n. NT, n. WA …… 3

–. Eye smaller, <1.3 x as long as orbit, if slightly larger then elytra with fairly distinct dark spot in apical two-thirds. SA, sw. & ce. NSW, c. & e. QLD, c. NT, VIC …….. 5

3 Elytra completely black; intervals with fine punctures; head with coarse, dense strioles, even on centre of frons; pronotum not much striolate on disc; aedeagus with short, lancet-shaped apex. n. WA north of Great Sandy Desert, n. NT ……... *atripennis* Baehr, 2009

–. Elytra not completely black, at least the humeral area reddish; intervals with coarser punctures; aedeagus unknown. Distribution different …….. 4

4 Elytra largely dark, only the humeral area rufous; elytral intervals with almost uniseriate, markedly coarse punctures; centre of frons not striolate, widely glossy; pronotum not very striolate on disc, more cordiform, ratio widest diameter/base 1.36. sw. margin of the Pilbara, n. WA south of Great Sandy Desert ……. *occidentalis* Baehr, 2009

– Elytra largely reddish, only apex with ill defined, semilunar area dark; elytral intervals with irregularly biseriate, less coarse punctures; centre of frons densely striolate; pronotum densely striolate on disc, less cordiform, ratio widest diameter/base 1.23. Interior of n. QLD …… ……..... *carpentariae* Baehr, 2009

5 Elytra bivittate (Fig. 2); head rather quadrate with wide base and eye small in comparison with orbit (Fig. 3) and elytral intervals with almost uniseriate punctures; aedeagus unknown. ce. NSW … *bivittatus* **subsp. n.**

– Elytra either uniformly castaneous or with dark spot in apical two-thirds; head not quadrate and with narrower base or eye larger or elytral intervals with biseriate punctures. Distribution different …… 6

6 Elytra castaneous, without defined dark spot; pronotum very wide, ratio w/l >1.32 and wide compared with head, ratio width pronotum/head >1.27; aedeagus elongate and slender, with very short and thick, apically rounded, apex. Near Mt Bluffkin, ce. QLD (south of Mackay) ……. ……... *geoffreyi* Baehr, 2009

– Elytra usually with fairly well defined dark spot in apical two-thirds; aedeagus slightly less elongate and slender, with longer, rather spoon-shaped apex; ratios different …… 7

7 Elytral intervals with coarse, rather sparse and almost uniseriate punctures; aedeagus larger and more slender, with shorter, slightly more spoon-shaped apex. s. SA, nw. VIC, sw. NSW, c. QLD, c. NT …… …… *puellarum* (s. str.) Baehr, 2009

– Elytral intervals with less coarse, irregularly biseriate punctures; aedeagus smaller and more compact, with slightly longer, less spoon-shaped apex. se. coastal QLD …….. *brisbanensis* Baehr, 2009

Rugitarus puellarum bivittatus **subsp. n.**

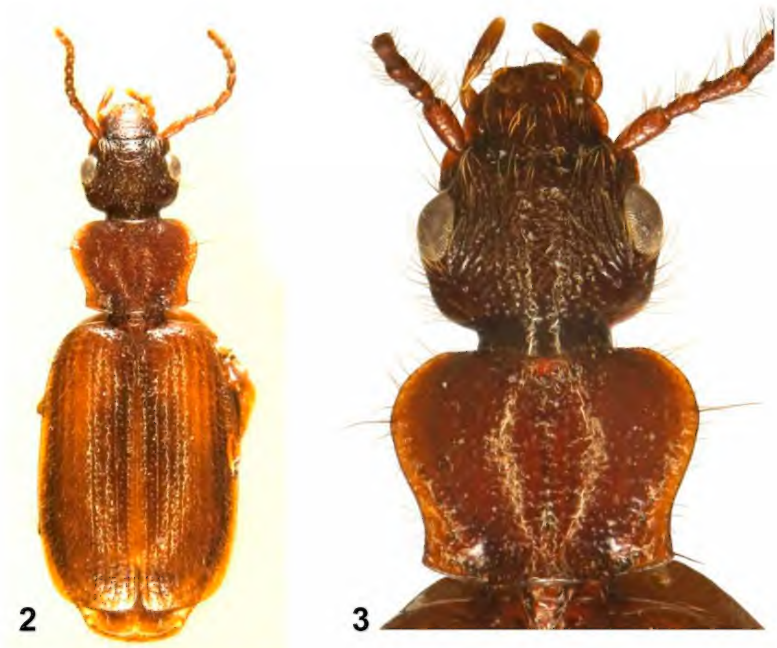
(Figs 2-3)

Type material. Holotype ♀, NEW SOUTH WALES: 32.810°S x 148.347°E, Sawpit Gully Rd, Goobang NP, 520 m, 23Jan2015, G.Monteith, Barkspray, eucs, 37644 (in Queensland Museum, Brisbane – QMT 239564).

Diagnosis. Distinguished from all other subspecies by the bivittate pattern of the elytra and by a more concave basal part of the lateral margin of the pronotum; in addition, distinguished from most species by the markedly quadrate head with wide base, by short elytra and by rather small eye.

Description. Measurements. Length: 5.75 mm; width: 2.25 mm. Ratios. Length eye/orbit: 1.17; width/length of pronotum: 1.34; width widest diameter/base of pronotum: 1.21; width pronotum/head: 1.24; length/width of elytra: 1.46; width elytra/pronotum: 1.57.

Colour (Fig. 2). Head rusty red, pronotum slightly paler, elytra also rusty red but with a wide, longitudinal, pale red stripe. Lower surfaces of head and prothorax rufous, of abdomen pale red. Antenna and mouthparts rufous, basal half of apical palpomeres darker than apex. Femora pale red, tibiae and tarsi slightly darker.



Figs 2-3. *Rugitarus puellarum bivittatus* **subsp. n.**, holotype female: (2) dorsal view, body length 5.75 mm; (3) detail of head and pronotum.

Head (Fig. 3). Wide and markedly quadrangular with wide, laterally obtusely rounded base; much narrowed to neck, narrower than prothorax. Eye slightly longer than orbit to neck, laterad slightly projected over the orbit. Orbit very slightly oblique, obtusely quadrangular, forming an approximate rightangle with the neck. Mouthparts as in other subspecies. Antenna moderately short, just surpassing base of pronotum, median antennomeres *ca* 1.5 x as long as wide, completely pilose, pilosity elongate. Both supraorbital setae present but the posterior seta shorter and difficult to detect within the elongate pilosity. Whole upper surface coarsely punctate, frons medially of the eye with several elongate and deep, irregularly curved sulci, which become shorter towards middle, centre of frons and occiput punctate but not sulcate. Whole surface with elongate, erect pilosity. Microreticulation absent except on labrum, where it is isodiametric, surface glossy.

Pronotum (Fig. 3). Much wider than long, wider than head, cordiform, with wide base. Apex in middle rather deeply excised, apical angle barely produced, widely rounded. Lateral margin anteriorly convex, with short, rather deep excision in front of the angulate and laterad slightly projected basal angle. Base laterally slightly oblique. Apex not margined, base laterally

indistinctly margined. Both transverse sulci present but very shallow. Median line shallow, barely attaining apex and base. Lateral marginal sulcus fairly wide, moderately depressed, near base not much widened, margin slightly upturned. Anterior marginal seta inserted at anterior two-fifths, posterior seta inserted at basal angle. Both setae elongate, far longer than the erect setae along the lateral margin. Surface with moderately sparse, coarse punctures and with distinct and coarse, irregularly transverse strioles. Microreticulation absent, surface glossy. Pilosity elongate, more or less erect.

Elytra (Fig. 2). Comparatively short (within the species), wide at base and somewhat quadrangular, but considerably widened towards apex, laterally but slightly rounded, surface depressed. Humerus barely projecting, widely rounded. Lateral apical angle evenly rounded, apical margin gently convex, slightly incurved towards suture. All striae complete and well impressed, punctulate. Intervals rather depressed, with rather coarse, irregularly uniseriate punctures. Marginal series of punctures difficult to distinguish when setae broken, consisting of 6 humeral, one intercalar, and 6 apical punctures. Microreticulation absent, pilosity moderately dense, elongate, more or less erect. 3rd interval bipunctate, both punctures situated in middle of 3rd interval, the anterior one slightly behind the basal third, the posterior one near apex, punctures difficult to distinguish but setae perceptibly longer than the erect pilosity. Surface without microreticulation, glossy.

Metathoracic wings. Fully developed.

Lower surface. Whole lower surface sparsely punctate and with elongate, erect pilosity. Metepisternum fairly elongate, *ca* 2 x as long as wide at apex. Terminal abdominal sternum in the female holotype 6-setose.

Legs. Similar to those of the other subspecies.

Male genitalia. Unknown.

Female gonocoxites. Similar to those of the other subspecies, see Baehr (2009: fig. 6).

Variation. Unknown.

Etymology. The name refers to the presence of a longitudinal pale stripe in the middle of each elytron, which gives the elytra a bivittate appearence.

Distribution (Fig 1). Central-eastern New South Wales 40 km NNE of Parkes. Known only from type locality in Goobang National Park.

Collecting circumstances. Holotype collected by barkspray on trunks of large eucalypt trees with shedding bark within a large tract of eucalypt woodland.

Relationships. In some character states, *e.g.* eye size, proportions of prothorax and elytra and punctation of the elytral striae, this subspecies is rather similar to the nominate subspecies. In coloration of elytra and in head shape, however, it is well differentiated from this and the other subspecies.

Discussion

This is the first record of *R. puellarum* from eastern New South Wales. The geographically nearest subspecies either occur further west, in southwestern Queensland and western New South Wales (*R. p. puellarum* s. str.), or in southeastern Queensland (*R. p. brisbanensis*), but both subspecies deviate in certain character states of coloration and shape of head and/or pronotum from *R. p. bivittatus*. According to the label data, the biology of the new subspecies apparently matches that of other populations, namely the occurrence under bark or, more commonly, in deep cracks of the bark of eucalypts, acacias and other tree species. Relative measurements of the various subspecies are shown in Table 1.

Table 1. Revised table of measurements and ratios of the subspecies of *Rugitarus puellarum* Baehr.

	N	Body length (mm)	Ratio length/eye orbit	Ratio width/length pronotum
R. p. puellarum s. str.	38	4.25-6.0	1.0-1.3	1.24-1.40
R. p. brisbanensis	6	4.75-5.1	1.2-1.3(1.4)	1.19-1.26
R. p. geoffreyi	2	5.3-5.45	1.3	1.32-1.36
R. p. atripennis	9	5.2-5.7	1.55-1.65	1.25-1.32
R. p. occidentalis	1	5.4	1.5	1.26
R. p. carpentariae	2	5.2-5.6	1.6-1.65	1.28-1.30
R. p. densepilosa	3	5.4-5.65	1.35-1.4	1.30-1.32
R. p. bivittatus	1	5.75	1.2	1.34

	Ratio widest diameter/base pronotum	Ratio width pronotum/ head	Ratio length/ width elytra	Ratio width elytra/ pronotum
R. p. puellarum s. str.	1.18-1.30	1.10-1.25	1.10-1.25	1.56-1.67
R. p. brisbanensis	1.14-1.23	1.22-1.28	1.48-1.54	1.56-1.65
R. p. geoffreyi	1.19-1.23	1.27-1.29	1.53-1.54	1.56-1.59
R. p. atripennis	1.26-1.35	1.12-1.21	1.41-1.46	1.62-1.72
R. p. occidentalis	1.36	1.11	1.49	1.68
R. p. carpentariae	1.23-1.29	1.14	1.46-1.47	1.62-1.63
R. p. densepilosa	1.16-1.19	1.27-1.29	1.55-1.57	1.56-1.58
R. p. bivittatus	1.21	1.24	1.46	1.57

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Reference

BAEHR, M. 2009. Revision of the species of the genus *Anomotarus* (s. l.) Chaudoir from the Australian Region, formerly alluded to the genus *Nototarus* Chaudoir (Insecta, Coleoptera, Carabidae, Lebiinae). *Coleoptera* **13**: 33-200.

A NEW SPECIES OF *MOLOPHILUS (SUPERBOMOLOPHILUS)* THEISCHINGER (DIPTERA: LIMONIIDAE) FROM THE BARRINGTON TOPS REGION OF NEW SOUTH WALES, AUSTRALIA

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Abstract

One new species of Australian *Molophilus* Curtis is described: *Molophilus* (*Superbomolophilus*) *barringtonensis* **sp. n.** from the Barrington Tops region of New South Wales, Australia. Its affinity with the closely related species *Molophilus (Superbomolophilus) froggatti* Skuse is discussed.

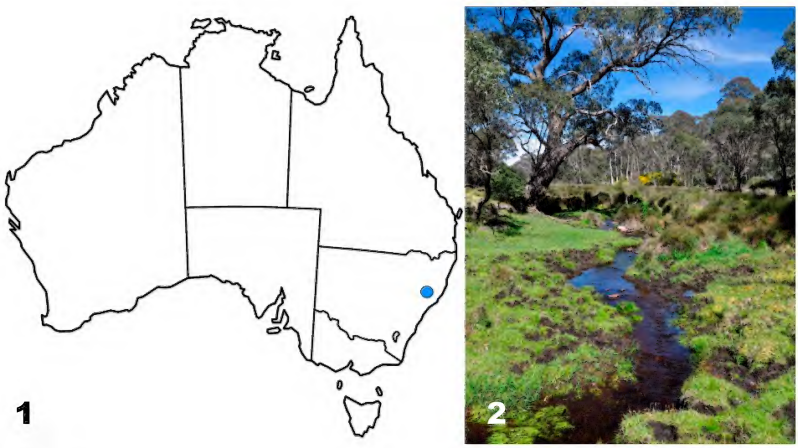
Introduction

Australia boasts a great diversity of *Molophilus* Curtis crane flies with 316 species recorded (Oosterbroek 2019), including the species newly described here. The vast majority of Australian *Molophilus* species are endemic and several *Molophilus* subgenera are also restricted to Australia. This is true of the subgenus *Superbomolophilus* Theischinger, which was first recognized during a review of the *Molophilus* species of Queensland and Western Australia (Theischinger 1988). At that time, Theischinger recognized only two species as belonging to *Superbomolophilus*: *Molophilus* (*S.*) *brumby* Theischinger, 1988 and *M.* (*S.*) *froggatti* Skuse, 1890, which had been previously regarded by Alexander (1929) as belonging to the '*gracilis* group, *ruficollis* subgroup' of *Molophilus* sensu stricto. Theischinger (1992) then placed an additional five species in *Superbomolophilus,* three of which were newly described. Theischinger (1994, 1996a) later added a further two species to the subgenus. The present paper further adds to the knowledge of the Australian fauna by describing a newly discovered species, thereby increasing the total number of known *Superbomolophilus* species to ten.

The new species, *Molophilus* (*Superbomolophilus*) *barringtonensis* **sp. n.**, was discovered during an informal survey of the crane flies of the Barrington Tops region of New South Wales, undertaken by the authors in late 2018. During this survey over 30 locations were visited across Barrington Tops and nearby areas, including Mount Royal, Chichester Forest and Gloucester Tops. *M.* (*S.*) *barringtonensis* was only found at three locations, all on the Barrington Tops high plains (Fig. 1) at altitudes above 1,400 m along the banks of small upland streams (Fig. 2).

Species of *Superbomolophilus* are distinguished from other subgenera of *Molophilus* by having the parameres completely separate, with each

connected to the base of the mesal face of the gonocoxites. The key provided by Theischinger (1996b) aids greatly in identification of *Molophilus* and other limoniid genera and, coupled with the descriptive notes below, *M.* (*S.*) *barringtonensis* can be readily distinguished from closely related species.



Figs 1-2. *Molophilus* (*Superbomolophilus*) *barringtonensis* **sp. n.**: (1) known distribution; (2) type locality - Little Murray Creek by Copperhead Crossing.

Materials and methods

Specimens were collected by sweeping a hand net through vegetation and then preserved in 100% ethanol. As a result of this preservation, the colour of specimens might have changed from the natural state. The illustrations of the male genitalia (hypopygium) are from specimens cleared in KOH and displayed in glycerol.

Specimens have been deposited in the Museum Victoria (NMV) collection, Melbourne and in the Entomology collection of the Australian Museum (AM), Sydney. Specimens retained by the first author are kept in a vouchered research collection at the GHD Water Sciences laboratory in Melbourne to aid in ongoing survey work and for use in DNA barcoding studies. DNA sequencing efforts are ongoing; sequence and specimen data are stored in the Barcode of Life Data Systems (BOLD) database and, upon any future publication of genetic data, sequences will be published to GenBank.

Descriptive terminology is in accord with McAlpine (1981).

Abbreviations as used in figures: *ae*, aedeagus; *cerc*, cercus; *ge*, gonocoxite; *ig*, inner gonostylus; *og*, outer gonostylus; *pm*, parameres; *t9*, tergite 9; *vl*, ventral lobe of gonocoxite; *vlv*, hypogynial valve.

***Molophilus* (*Superbomolophilus*) *barringtonensis* sp. n.**

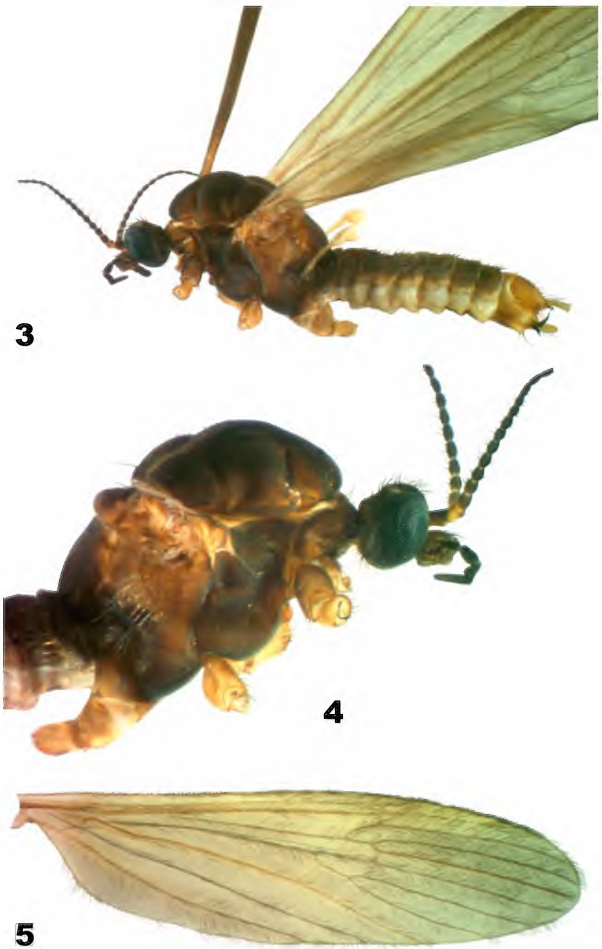
(Figs 3-8)

Type material. Holotype ♂, NEW SOUTH WALES: Barrington Tops, Little Murray Creek by Copperhead Crossing Track (31.982°S, 151.45801°E), 13 Nov 2018, Z. Billingham & G. Theischinger, NMV (T22401). *Paratypes*: 15 ♂♂, 15 ♀♀, same data as holotype, NMV (T22402-T22431); 1 ♂, 1 ♀, in copula, same data as holotype, NMV (T22432-T22433); 2 ♂♂, 2 ♀♀, same data as holotype, AM; 1 ♂, same data as holotype, GHD (T21512); 2 ♂♂, New South Wales, Barrington Tops, Edwards Creek off Edwards Swamp Walking Track (32.035°S, 151.436°E), 13 Nov 2018, Z. Billingham & G. Theischinger, GHD (T21825 & T21826); 1 ♂, 2 ♀♀, New South Wales, Barrington Tops, Polblue Creek off Polblue Swamp Walking Track at Polblue Campground (31.957°S, 151.432°E), 12 Nov 2018, Z. Billingham & G. Theischinger, GHD (T23576-T23578).

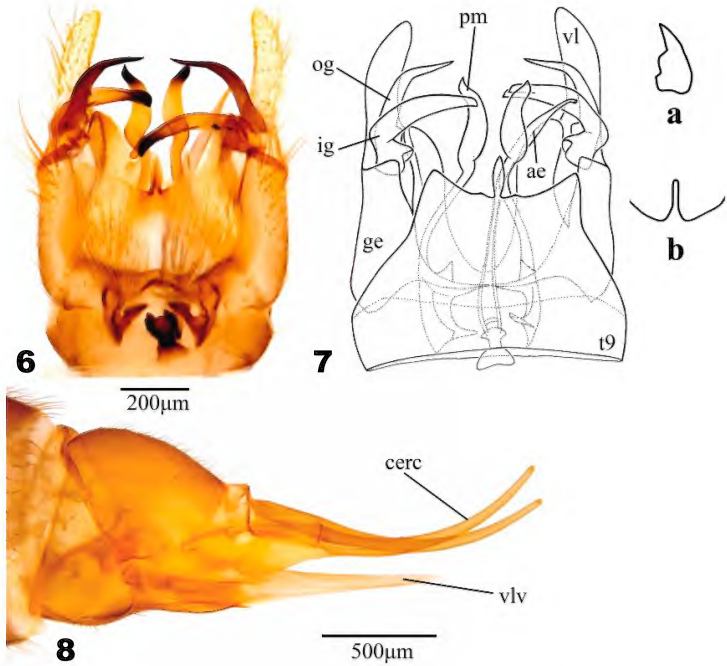
Description. Male (Fig. 3): body length (excluding antenna) 6.8 mm, wing length 9.0 mm. Head dark greyish brown, antennal pedicel golden brown, otherwise antenna and palpus dark brown. Antenna extending back to prescutal suture. Pronotum golden brown. Prescutum, scutum, mediotergite and scutellum dark brown, with light silver-grey pruinosity, paler golden brown at the prescutal pit, the centre of the transverse suture, the lateral angles of the scutal lobes and the anterolateral corners of the scutellum. Paratergite pale yellow to white, forming a distinct pale stripe between terga and pleura. Pleurae dark brown, with light silver-grey pruinosity, the anepimeron and anatergite paling to golden brown dorsally (Fig. 4). Coxae golden brown, greyish brown along the dorsal edge, darkest on the forecoxa. Trochanters golden brown. Foreleg with basal 1/2 of femur golden brown, remainder of femur and tibia dark brown, tarsi black. Mid and hind leg with basal 1/3 of femur golden brown, remainder dark brown, tibia golden brown with distal 1/5 black, first tarsal segment with basal 1/2 pale golden brown, otherwise tarsi black. Wing (Fig. 5) pale grey tinged with yellow and with dense microtrichia along veins and wing margins. Halter with stem pale grey and knob whitish. Abdomen dark greyish brown. Hypopygium (Figs 6-7) golden brown with dorsal lobe of tergite 9 well developed, apical margin broadly concave, with a median lanceolate projection that extends to just beyond the caudolateral angles of the dorsal lobe. Gonocoxite with large ventral lobe, curved slightly mediad and tapering to a rounded apex, medial lobe of moderate size and dorsolateral lobe only minimally developed. Inner gonostylus bent medially at near rightangle just beyond its base, continuing as a large slightly curved rod, distally expanded with the apex bifid, tips blunt and of near equal size, the inner tip larger, more heavily sclerotised and blackened. Outer gonostylus large, narrower than inner gonostylus but approximately equal in length, curved, apex sharply pointed, heavily sclerotised and blackened. Parameres greatly developed, extending to approximately half the length of the ventral lobe, narrow and curving gently mediad along the basal 3/4 of their length, the distal 1/4 considerably

expanded, becoming somewhat sinuous, apices blackened and sharply pointed. Aedeagus about equal in length to the parameres, curving faintly laterally along its length, somewhat expanded at about 2/3 its length then narrowing at the apex.

Paratypes do not differ significantly from the holotype in overall coloration; however, individual size varies from 6.0-7.5 mm body length and 7.5-9.5 mm wing length.



Figs 3-5. *Molophilus* (*Superbomolophilus*) *barringtonensis* **sp. n.**: (3) habitus, lateral view; (4) head and thorax, lateral view; (5) wing.



Figs 6-8. *Molophilus* (*Superbomolophilus*) *barringtonensis* **sp. n.**: (6) hypopygium ventral view; (7) hypopygium detail [with outer gonostylus (a) and t9 medial projection (b) of *M.* (*S.*) *froggatti* alongside]; (8) ovipositor.

Females: with coloration much the same as males, wing length 8-10.5 mm. Ovipositor with apex of hypogynial valve reaching about 3/5 the length of the cercus (Fig 8).

Etymology. This species is named for the Barrington Tops region of New South Wales where it was collected.

Discussion. The shape and armature of the dorsal lobe of segment 9, the shape of the inner gonostylus and the development of the parameres indicate a close affinity between *M.* (*S.*) *barringtonensis* **sp. n.** and *M.* (*S.*) *froggatti* Skuse, 1890. *Molophilus* (*S.*) *barringtonensis* is, however, readily distinguished from *M.* (*S.*) *froggatti* by the largely developed outer gonostylus being nearly equal in length to the inner gonostylus, while in *M.* (*S.*) *froggatti* the outer gonostylus is never so developed. *Molophilus* (*S.*) *barringtonensis* is also distinguished by the lanceolate to ovate median projection of tergite 9, which in *M.* (*S.*) *froggatti* is more parallel-sided and acutely pointed. The outer gonostylus and median projection of tergite 9 (Fig. 7) illustrate the differences between these morphologically similar species.

Molophilus (*S.*) *froggatti* is apparently a variable species and specimens have been found with parameres varying from distally greatly sinuous to nearly straight, dorsal lobe of tergite 9 deeply concave and v-shaped to broadly concave and u-shaped, and outer gonostylus from 1/4 to 1/2 the length of the inner gonostylus. It is unclear at this time if these variations constitute distinct species; however, even if *M.* (*S.*) *froggatti* as it is currently known were shown to be a species complex, the validity of *M.* (*S.*) *barringtonensis* is clear and it is readily distinguished from other species using the traits discussed.

Acknowledgements

Specimens collected from protected areas were done so under NSW National Parks & Wildlife Service scientific licence number SL101930. The map provided in Fig. 1 was modified from wikipedia (*https://commons.wikimedia.org/wiki/File:Australia_states_blank.png*) under a creative commons license. We wish to thank John Martin from the Australian Museum for assistance with photographs of genitalia, Peter Beard and the Gloucester NPWS office for kindly allowing access to the Little Murray hut. The Gutteridge, Haskins & Davey (GHD Pty Ltd) water sciences team is highly appreciated for their support of the first author's studies.

References

ALEXANDER, C.P. 1929. Notes on the Australian species of *Molophilus* (Tipulidae, Diptera). I. *Proceedings of the Linnean Society of New South Wales* **54**: 137-144.

MCALPINE, J.F. 1981. Morphology and terminology—adults. Pp 9-63, in: McAlpine, J.F., Peterson, B.V., Shewell, G.E., Teskey, H.J., Vockeroth, J.R. and Wood, D.M. (coordinators), *Manual of Nearctic Diptera*, Vol. 1. *Research Branch, Agriculture Canada Monograph* **27**. Ottawa.

OOSTERBROEK, P. 2019. Catalogue of the craneflies of the World (CCW). Available online at *ccw.naturalis.nl*

SKUSE, F.A.A. 1890. Diptera of Australia. Part VII – The Tipulidae Brevipalpi. *Proceedings of the Linnean Society of New South Wales* **4**: 757-892.

THEISCHINGER, G. 1988. The genus *Molophilus* Curtis in Queensland and Western Australia (Insecta: Diptera: Tipulidae: Limoniinae: Eriopterini). *Stapfia* **17**: 163-200.

THEISCHINGER, G. 1992. The Limoniinae (Diptera: Tipulidae) of Australia. II. The genus *Molophilus* Curtis. *Stapfia* **27**: 5-150.

THEISCHINGER, G. 1994. The Limoniinae (Diptera: Tipulidae) of Australia. IV. New and insufficiently known species of *Gynoplistia* Macquart and *Molophilus* Curtis (Diptera: Tipulidae: Limoniinae) from Australia. *Stapfia* **36**: 1-36.

THEISCHINGER, G. 1996a. The Limoniinae (Diptera: Tipulidae) of Australia. VI. New and insufficiently known species of *Toxorhina* Loew, *Limonia* Meigen, *Atarba* Osten-Sacken, *Amphineurus* Skuse, *Gonomyia* Meigen and *Molophilus* Curtis. *Stapfia* **44**: 1-18.

THEISCHINGER, G. 1996b. The Limoniinae (Diptera: Tipulidae) of Australia. VIII. Preliminary key to the genus-group taxa. *Stapfia* **44**: 117-144.

DESCRIPTION OF A SECOND SPECIES OF THE GENUS *AUSTRALOCLERUS* OPITZ (COLEOPTERA: CLERIDAE)

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Abstract

Australoclerus opitzi **sp. n.** is described from a specimen collected near Tolga, northern Queensland. A differential diagnosis is provided to distinguish the new species from *A. bartletti* Opitz, the type of the hitherto monotypic genus *Australoclerus* Opitz. Genus level characters for *Australoclerus* are discussed. High resolution images are provided for both species.

Introduction

The subfamily Peloniinae (Opitz 2010), inadequately defined by a non-discrete, continuous antennal character (Bartlett 2013), is not recognised by several authors (Bouchard *et al.* 2011, Bartlett 2013, Gunter *et al.* 2013, Gimmel *et al.* 2019). Nevertheless, Opitz (2017) reviewed the world genera of Peloniinae and recognised 46 genera including five from Australia, *viz.* *Antennactis* Opitz, *Australoclerus* Opitz, *Eriviriosus* Opitz, *Gnidmus* Bartlett and *Hautenerus* Bartlett. The monotypic *Australoclerus*, the subject of this paper, is differentiated from the aforementioned genera by the presence of a basal umbo and longitudinal discal ridge on each elytron. *Australoclerus bartletti* Opitz, 2017, was described from four specimens collected in rainforest-associated locations in southeastern Queensland and northern New South Wales. A second *Australoclerus* species, represented by a single specimen collected in December 1995 near Tolga, northeastern Queensland and known to the author at the time of Opitz' (2017) publication, is described below.

Materials and methods

Abbreviations: A – Antennomere; AMS – Australian Museum, Sydney, New South Wales; JSBC – Justin S. Bartlett Collection, Brisbane, Queensland; QM – Queensland Museum, Brisbane, Queensland.

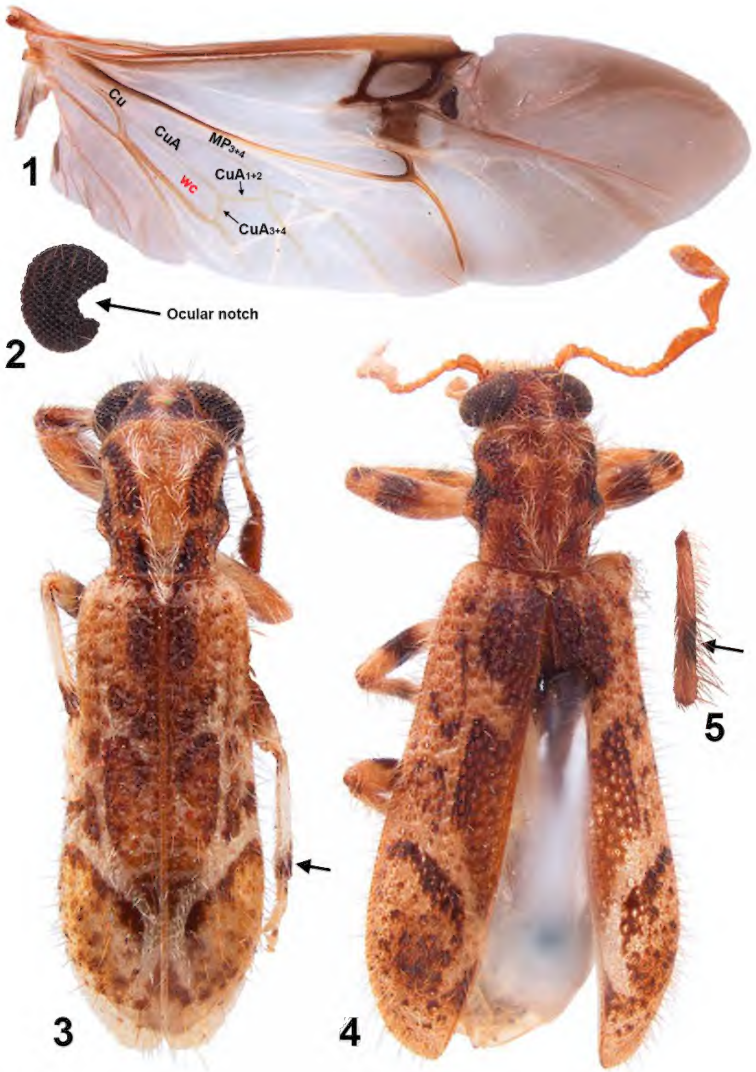
Measurements were made using a scale reticule fitted to a Nikon SMZ-1500 stereo dissecting microscope, with which specimens were examined. Body length is the distance from the distal limit of the clypeus to the elytral apices.

Australoclerus bartletti Opitz, 2017

(Figs 1-3)

Material examined. QUEENSLAND: 1 ♀, 27.329ºS x 152.757ºE, Mt Glorious, Barracks, 575 m. 19-30 Oct 2009, RF, G.B. Monteith, Malaise, 19154 // Gift from G.B. Monteith, Dec 2009 (JSBC). NEW SOUTH WALES: 1 paratype, Victoria Park, SE Lismore, 25 Dec 1993, ex Subtropical rain forest, G. Williams (AMS).

Remarks. Opitz (2017) described the morphology and illustrated the pronotum, male antenna, tegmen, phallus and spicular fork of *A. bartletti*.



Figs 1-5. *Australoclerus* spp: (1-3) *A. bartletti* Opitz: (1) hind wing showing closed wedge cell (WC) (wing length = 7.2 mm); (2) compound eye showing conspicuously emarginate ocular notch; (3) paratype of undetermined sex from Victoria Park Nature Reserve (length = 4.7 mm), with arrow indicating distal macula of metatibia. (4-5) *A. opitzt* **sp. n.**: (4) female holotype (length = 7.3 mm); (5) metatibia, with arrow indicating pre-distal macula.

Characters for distinguishing *A. bartletti* from the new species are provided below. Figures 1-3 respectively illustrate the hind wing, ocular notch and body in dorsal view.

***Australoclerus opitzi* sp. n.**

(Figs 4-5)

Type. Holotype ♀, QUEENSLAND: 17°13'S x 145°25'E, 3 km W Bones Knob, 10 Dec 1995, 1100 m, Monteith Cook Thompson, Pyrethrum, trees & logs (QM, Reg. No. T244899).

Diagnosis. The new species can be distinguished from *A. bartletti* Opitz by the more circular form of the basal elytral umbo (oblong in *A. bartletti*), the pre-distal position of the dark tibial band (Fig. 5) (distal in *A. bartletti*, see Fig. 3), dorsolateral pronotal carina extending from base to one-third the distance between apex of lateral tubercle and anterior pronotal margin (not extending beyond apex of tubercle in *A. bartletti*) and elytral punctures that extend to the apices and lack lateral nodules (those of *A. bartletti* terminate before apical slope with many punctures bearing lateral nodules). The elytral patterns of *A. opitzi* **sp. n.** (Fig. 4), though bearing some similarities, are less sharply defined than those of *A. bartletti* (Fig. 3) and the pronotum lacks the distinct white midline of *A. bartletti*.

Description. Body length. 7.3 mm. Head with cranium densely punctate above, transversely wrinkled below; vertex dark brown and orange-brown with a central pale yellowish macula, frons between eyes orange-brown, frons above epistomal suture orange-brown laterally with a central ovate yellowish macula flanked by smaller black-brown subtriangulate maculae, clypeus orange-brown, anteclypeus semitransparent orange; genae dark brown posteriorly, yellowish anteriorly, gula yellow; mandibles brownish laterally, otherwise black; ventral mouthparts including palpi yellowish; antennae yellowish, scape bulging with upper hind margin carinate, pedicel small and slightly bulbous, A3-8 filiform, A3 about 1.5 x length of pedicel, A4 and A6 about as long as pedicel, A5 and A7 slightly longer than A4 and A6, A8 about as long as wide, A9 about as long as A3-8 combined, A10 and A11 similar in length to A9.

Thorax. Pronotum slightly longer than wide (including lateral tubercles), disc profusely and densely punctured; disc orange-brown with irregular-shaped black-brown markings laterally; area ventral to lateral carina yellow, punctate; pronotal projection smooth, black-brown basally, yellowish apically; prosternum dark brown laterally, yellow-brown medially, round punctures anterior of coxae; mesoventrite orange medially, black-brown laterally; mesanepisternum and mesepimeron black-brown; metaventrite mostly blackish, orange along midline and near posterior margin; background colour of elytra yellow, basal two-thirds of elytra along suture with large dark

brown areas interrupted at middle and scattered dark brown sections bordering a wide arcing whitish yellow band at apical third and other less easily definable patterns (similar to those of *A. bartletti* although with thicker pale sections and more black along suture; compare Figs 3 and 4); discal punctation extending to apices, not arranged into distinct rows, punctures ovate and lacking lateral nodules; umbo at elytral base slightly less pronounced than in *A. bartletti*; discal setae golden. Coxae and legs yellowish, femora with a black-brown band at apical third, tibiae also with preapical black-brown band at apical third, protibiae also dark at extreme base; tarsi including ventral pads yellowish.

Abdomen. Sternites pale yellow-brown.

Etymology. This species is named for Weston Opitz, prolific cleridologist and author of the genus *Australoclerus*.

Distribution. According to label data, the *Australoclerus opitzi* holotype was collected 3 km west of Bones Knob (17°13'S x 145°25'E). More precise GPS coordinates (17.2280S x 145.4181E), provided by one of the collectors (G.B. Monteith), show the collecting locality at the top of a rainforested plateau referred to by locals as 'Jungle Top' (G.B. Monteith pers. comm.). The next closest rainforest, Baldy Mountain Forest Reserve three to four kilometres to the south, represents the northernmost section of a chain of almost continuous rainforest 'islands' that connect to the larger Tully Falls National Park near Maalan. Whether *A. opitzi* is isolated on 'Jungle Top' or persists in rainforest to the south is unknown.

Comment on generic characters

The new species conforms in most regards to Opitz' (2017) generic description for *Australoclerus*, although with the following exceptions: 'elytral base with oblong umbo' – the umbo of the elytral base of *A. opitzi* is more circular than oblong; 'anterior limit of [pronotal] dorsolateral carina extends to apex of pronotal tubercle' – that of *A. opitzi* extends one-third the distance towards the anterior pronotal margin from the apex of the pronotal tubercle; 'large asetiferous punctations end at posterior two-thirds [of elytron]' – those of *A. opitzi* extend to the elytral apical margin. The degree of variability in these characters therefore renders them not useful at the genus level for *Australoclerus*.

Within the generic description of *Australoclerus*, Opitz (2017) defined the size of the ocular notch as small and the hind wing wedge cell as open. This study found that the wedge cell is closed (*i.e.* the base of vein CuA is not disconnected from Cu and cross-vein CuA3+4 is intact) in *A. bartletti* (see Fig. 1) and that the ocular notch (Fig. 2) in both species is relatively conspicuous.

Acknowledgements

The author wishes to thank: Dr Dave Britton (formerly of the Australian Museum, Sydney); Dr Christine Lambkin and Susan Wright (Queensland Museum, Brisbane) for facilitating Museum visits and specimen loans; Dr Geoff Monteith for gifting a specimen of *A. bartletti* to the author and for elaborating on the collecting locality of the *A. opitzi* holotype; and Dr Weston Opitz for many stimulating discussions on clerid morphology and systematics over the years.

References

BARTLETT, J.S. 2013. A revised taxonomy for Australian *Teneropsis* Chapin and *Cregya* LeConte (Coleoptera: Cleridae: Korynetinae). *Memoirs of the Queensland Museum, Nature* **58**: 411-420.

BOUCHARD, P., BOUSQUET, Y., DAVIES, A.E., ALONSO-ZARAZAGA, M.A., LAWRENCE, J.F., LYAL, C.H.C., NEWTON, A.F., REID, C.A.M., SCHMITT, M. ŚLIPIŃSKI, A.S. and SMITH, A.B.T. 2011. Family-group names in Coleoptera (Insecta). *Zookeys* **88**: 1-972.

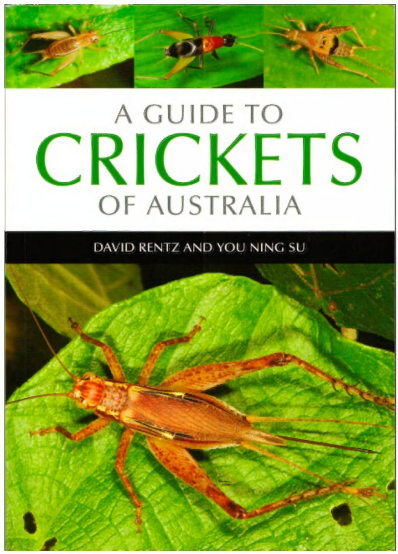
GUNTER, N.L., LEAVENGOOD, J.M., BARTLETT, J.S., CHAPMAN, E.G. and CAMERON, S.L. 2013. A molecular phylogeny of the checkered beetles and a description of Epiclininae a new subfamily (Coleoptera: Cleroidea: Cleridae). *Systematic Entomology* **38**(3): 626-636.

GIMMEL, M.L., BOCAKOVA, M., GUNTER, N.L. and LESCHEN, R.A.B. 2019. Comprehensive phylogeny of the Cleroidea (Coleoptera: Cucujiformia). *Systematic Entomology.* 32 pp. (early view published on 3 January 2019, doi: 10.1111/syen.12338).

OPITZ, W. 2010. Classification, natural history, phylogeny, and subfamily composition of the Cleridae and generic content of the subfamilies (Coleoptera: Cleroidea). *Entomologica Basiliensia et Collectionis Frey* **32**: 31-128.

OPITZ, W. 2017. Classification, natural history, and evolution of the subfamily Peloniinae Opitz (Coleoptera: Cleroidea: Cleridae). Part VII. The world genera of Peloniinae (Coleoptera: Cleridae). *Linzer biologische Beiträge* **49**(1): 29-117.

BOOK REVIEW



A Guide to Crickets of Australia by David Rentz and You Ning Su. 398 + xvii pp, CSIRO Publishing, Melbourne. ISBN: 9781486305063. Price $49.99.

The latest in the successful series of Australian field guide books being published by CSIRO Publishing covers the crickets of Australia and is the third to be produced by the series' most prolific author, David Rentz, who has previously published guides to the katydids (2010) and the cockroaches (2014) of Australia. It is also the largest volume in the field guide series and has slightly lighter weight paper to keep its 400 plus pages down to a "field" size. This time David teams up with You Ning Su, from CSIRO Australian National Insect Collection, as co-author. You Ning has a wide interest in the Orthoptera and has published on the cricket subfamily Nemobiinae.

Many insects go under the name 'cricket' and the book starts by defining its coverage as being the 'true' crickets in the Grylloidea (now comprising four families) plus the mole crickets (Gryllotalpidae) and the ant crickets (Myrmecophilidae). The book is much more than a field guide and has comprehensive chapters on cricket habitats, biology, morphology and collecting, as well as a couple of quirky chapters on crickets in culture (singing pets and fighting pets) and as human food, the last complete with actual recipes. It also traces the history of the study of Australian crickets with portraits and brief biographical sketches of the early workers on the fauna (the cricketers!). It has a special section on the landmark year spent in Australia by US workers Richard Alexander and Dan Otte in 1968-69, which led to their massive 1983 monograph of the Australian gryllid fauna. This includes some historic photos from that venture.

The main part of the book deals comprehensively with the 92 genera now known from Australia and has a checklist of species that brings up to date all the many taxonomic changes and additions since the 1983 monograph. It is illustrated with many hundreds of magnificent close-up colour photographs, mostly of live animals, and often showing details of behaviour in the field. Tables of characters are given to assist with placing species in genera and many of the original line illustrations from the 1983 monograph are reproduced to assist this process. The book shows that there are hundreds of crickets still undescribed from Australia and it will be an essential book for the next generation of 'cricketers' to carry on elucidating this important part of our fauna.

G.B. Monteith

THE AUSTRALIAN ENTOMOLOGIST
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COVER

The Richmond Birdwing, *Ornithoptera richmondia* is the smallest member of its genus and the only *Ornithoptera* species found outside the tropics. It is endemic to southern Queensland and northern New South Wales. This female, seen at Mary Cairncross Scenic Reserve in the Sunshine Coast hinterland, is searching for a place to lay its eggs in the forest understory near the entrance to the rainforest walk. It requires soft young growth of the vine *Pararistolochia praevenosa* and is more commonly seen high overhead in the subcanopy. The species is regarded as vulnerable and has been the target of a concerted community based recovery plan now managed by the Queensland Government Department of Environment and Science. Pen and ink drawing by *Australian Entomologist* contributor Dr Albert Orr, an award-winning author of illustrated butterfly and dragonfly books in Australia and overseas.

NOTES FOR AUTHORS

We welcome manuscripts dealing with non-pest aspects of the native insect and arachnid faunas of Australia, New Guinea, New Zealand and islands in the south-western Pacific region. Manuscripts for consideration for publication should be submitted in Microsoft Word. Digital illustrations should be sent initially as low resolution images in a separate Word file, as low resolution JPEGs, or as low resolution PDF files, with figure numbers indicated clearly for each figure. High resolution TIFFs or JPEGs (300 dpi at print size) must be provided at the time of acceptance of the manuscript. Digital manuscripts and illustrations may be sent via email to geoff.monteith@bigpond.com or can be posted on disk or USB to:

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The Australian Entomologist
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Authors should refer to recent issues for format and style. An example issue is available on the ESQ website at http://www.esq.org.au/pdf/aust_ent_44_3.pdf

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